Recommendations and Guidelines for:

Recognition and Intervention of Risk Factors for Stroke

Diagnosis and Treatment of Transient Ischemic Attack

Diagnosis and Treatment of Ischemic Stroke

Indiana Stroke Prevention Task Force
January 2006

MISSION STATEMENT

1. **To assess the needs for comprehensive care of victims of stroke throughout the state.**

2. **To educate the public on the various aspects of stroke, including risk factors, prevention, and available treatment, with particular attention to high risk populations and geographic areas.**

3. **To maintain awareness among the general public and all health care providers of the most effective strategies for the prevention and treatment of stroke.**

4. **To provide guidelines from which the care of potential or actual stroke victims may have a common standard.**

5. **To advise the state department concerning grant opportunities for providers of emergency medical services and for hospitals to improve care of stroke patients.**

6. **To issue recommendations on other topics relevant to stroke care and prevention as they may arise.**

INTRODUCTION

Stroke has a major impact on life and economy in the United States, and more specifically, in Indiana. It is the third leading cause of death, and the leading cause of disability in our country. Indiana had the 7th highest stroke rate in the country in 2000, and ranked 18th in mortality from stroke in 2002. Ten people die from stroke everyday in Indiana. Currently, more than 2% of the population of Indiana is living with the sequelae of stroke. The cost for medical care for the patients discharged in Indiana with a diagnosis of stroke in 2003 was $300 million. The indirect costs related to lost productivity of these patients in the Indiana economy was much more.

The Indiana Stroke Prevention Task Force was created by IC 16-41-41, in an attempt to stem the tide of the trends described above. One of the charges to the Task Force is to develop guidelines for the management of stroke. There are many facets to this topic. Management of stroke does not include only the treatment of those individuals who have suffered such an event; management also involves an effort to prevent the event from occurring in the first place. In addition, patients may experience a near stroke (transient ischemic attack) which is a warning that a stroke could soon occur if intervention is not undertaken. Because of this very complicated and involved nature of managing stroke, the task force decided to develop more categorized guidelines. What is to follow, then, are guidelines separated into three topics: risk factors for stroke, transient ischemic attack, and ischemic stroke.

These guidelines were developed from currently available published information and experience as well as from guidelines and recommendations developed by other organizations, including The Brain Attack Coalition, American Stroke Association, American Heart Association, and Mayo Clinic, among others. The published recommendations that were used, were themselves developed with standard evidence-based medicine assessment criteria. In these guidelines, information derived from the aforementioned sources is provided as a background for the subsequent recommendations related to the various aspects of management.

The purpose of these guidelines is to provide a basis from which the management of stroke may proceed. These guidelines are intended to be the minimum standard for such management and a benchmark for all health care providers in Indiana who care for patients with stroke. Some diagnostic and therapeutic procedures are more substantially proven than others. Some of these procedures are more effective when utilized by more experienced or specifically trained operators. An attempt to address these issues in these guidelines has been made in consideration of the recommendations or regulations of other organizations or authorities. In addition, advances in the practice of medicine, which occur continuously, could render portions of the guidelines obsolete or inappropriate. The Task Force will make every effort to provide addenda to these guidelines should such situations arise.

ACKNOWLEDGEMENTS

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GUIDELINES FOR RECOGNITION AND INTERVENTION OF RISK FACTORS FOR STROKE

Purpose: To provide a basis for the medical community to more effectively identify those individuals with risk factors for stroke. To provide a minimum standard from which the treatment of these risk factors should be initiated by all health care providers for all affected individuals in the state of Indiana.

Introduction

I. Types of risk factors

A. Unmodifiable

B. Advancing age

1. Male gender
2. African-American ethnicity
3. Hereditary predisposition

C. Definite and modifiable

1. Asymptomatic carotid artery stenosis
2. Hypertension
3. Coronary artery disease
4. Atrial fibrillation
5. Cigarette smoking
6. Sickle cell disease
7. Transient ischemic attack / previous stroke

D. Definite and potentially modifiable

1. Diabetes mellitus
2. Hyperhomocysteinemia

E. Less well documented

1. Cholesterol and lipids
2. Other cardiac disease (e.g. cardiomyopathy, patent foramen ovale)
3. Obesity
4. Physical inactivity

5. Oral contraceptives / hormone replacement therapy
6. Alcohol / illicit drugs
7. Hypercoagulability / inflammation
8. Sleep apnea syndrome

II. General intervention

A. Recognize unmodifiable risks in each individual.

B. Realize that modifiable factors add risk on top of the unmodifiable factors.

C. All patients should be assessed for the presence of risk factors for stroke; especially those with unmodifiable factors

D. Risk factors should be documented in patient's medical record.

E. Inform the patient of the implication of risk factors on the occurrence of stroke.

F. Educate the patient on the consequences of stroke that relate to the patient's life.

G. Individually address each risk factor present.

III. Risk Factors

A. Asymptomatic carotid stenosis

1. Background

a) Risk

(1) Carotid stenosis of greater than 50% is associated with an increased risk of myocardial infarction and nonstroke vascular death

(2) May result in either thrombotic or embolic stroke if untreated with stenosis greater than 60% at a rate of 2.5% to 3% per year

(3) If treated medically, risk of ipsilateral (same side) stroke is 2% per year

2. If treated surgically, risk of ipsilateral stroke is 1% per year
3. Currently available medical treatment

a) Antiplatelet medications

b) Anticoagulant medications (Coumadin)

(1) All data to date do not indicate greater protections with anticoagulant but definite greater risk of complication with anticoagulant

c) Risk of treatment

(1) GI bleeding

(2) Intracranial bleeding

(3) Easy bruisability

4. Currently available interventional treatment

a) Carotid endarterectomy

(1) 3 of 5 studies did not show significant benefit over medical treatment

(2) Both studies which revealed benefit, indicated a 50% reduction in stroke risk compared to medical treatment

(3) The complication rate in both studies was very low (1.9%) and surgical benefit was negated with complication rates greater than 3%

(4) Limited data has often revealed higher complication rates where this procedure is performed less frequently

b) Carotid angioplasty and stenting

(1) No specific studies evaluating effectiveness in asymptomatic carotid stenosis although it is being done at some centers

(2) Preliminary studies and patient registries including both symptomatic and asymptomatic carotid stenosis are revealing comparable efficacy of stenting with endarterectomy and stenting is trending toward fewer complications

5. Recommendation

a) Diagnosis

(1) Physical exam

(a) Carotid bruit

(2) History

(a) Coronary artery disease

(b) Diabetes mellitus

(c) Hypertension

(d) Tobacco use

(e) Family history stroke

(3) Consider carotid stenosis in patient with history as above even without bruit

(4) Imaging

(a) Initially carotid duplex

(b) If greater than 60% carotid stenosis on duplex, then second imaging procedure with MR or CT angiography to verify

b) Treatment

(1) Inpatient with stenosis greater than 50%

(a) Antiplatelet medication

(b) Referral to cardiologist for evaluation of coronary artery disease

(2) Consider carotid endarterectomy in asymptomatic patients with greater than 70% stenosis

(a) Complication rate should be less than 3% for facility

(b) Ideally, surgeon should have documented fellowship training in this procedure

(c) Surgeon should be performing at least 25 cases per year

(d) Agreement that surgery is best option between neurologist, surgeon, and patient's primary care physician

(3) Consider angioplasty with stenting in asymptomatic patients with greater than 70% stenosis, and postendarterectomy restenosis, poor cardiac status, prior neck irradiation, or stenosis close to skull base or deep in chest

(a) Should be undertaken at facility accredited as part of research protocols or are designated comprehensive stroke centers

(b) Should be undertaken at facility and by practitioner with experience of 25 cases per year

(c) Ideally, practitioner should have fellowship training in this procedure

(d) Agreement that stenting is best option between neurologist, surgeon, interventionalists, and patient's primary care physician

B. Hypertension

1. Background

a) Risk

(1) Risk for stroke increases 1.6 times for every 10 mm Hg

(2) Increase in systolic blood pressure

(3) Nearly 50% of strokes may be prevented by controlling

(4) Blood pressure

b) Currently available treatment

(1) Diuretics

(2) Angiotensin-converting enzyme (ACE) inhibitors

(3) Beta-blockers

(4) Calcium channel blockers

(5) Alpha-blockers

2. Recommendations

a) Blood pressure should be checked in all patients regardless of age, gender, race, or heredity.

b) Individuals with “prehypertension” should be monitored every 6 months: prehypertension is systolic blood pressure between 120 mm Hg and 139 mm Hg or diastolic blood pressure between 80 mm Hg and 90 mm Hg.

(1) Initiate lifestyle changes: diet, exercise, weight loss.

c) Treat systolic blood pressure greater than 140 mm Hg in patients 18 years of age and older

(1) May require more than one medication

(2) Uncomplicated hypertension: consider diuretic or beta-blocker

(3) Type I diabetes, myocardial infarctions (MI) with systolic dysfunction and heart failure patients: consider ACE inhibitor

(4) Diabetes Type II: consider ACE inhibitors, alpha-blockers, calcium antagonists, low dose diuretics

d) In diabetics or patients with kidney disease, blood pressure goal should be 130/80 mm Hg

C. Coronary Artery Disease (CAD)

1. Background

a) Risk

(1) Risk of stroke after MI is 1% to 2% per year

(2) Greatest risk of stroke is in first month after MI (31%)

(3) Overall risk of stroke in patients with CAD is increased by 2.0 to 2.2 times

b) Currently available treatment

(1) Antiplatelet agents – reduce risk of stroke by 15-20%

(2) Statin agents – reduce risk of stroke by 25%

(3) ACE inhibitors – reduce risk of stroke by 30%

2. Recommendations

a) Assess patients for risk factors for CAD

b) ECG at age 40 and every 5 years if normal

c) If individual has documented CAD:

(1) Aspirin: 81 to 325 mg daily

(2) Clopidrogel (Plavix): 75 mg daily

(3) Statin agents: especially if LDL is greater than 70 mg/dl

(4) Consider ACE inhibitor

D. Atrial Fibrillation

1. Background

a) Risk

(1) Risk for stroke is 5% per year without treatment

(2) Risk increases with advancing age and / or presence of other risk factors

b) Currently available treatment

(1) Coumadin – reduces risk of stroke by 70% (brand name Coumadin is recommended due to potential variability of multiple available generic products)

(2) Antiplatelet medication – reduces risk of stroke by 20%

2. Recommendations

a) Diagnosis

(1) Electrocardiogram

b) Treatment

(1) Age less than 65 and no other risks: antiplatelet medication

(2) Age 65 to 75 and no other risks: antiplatelet medications or Coumadin

(3) Age less than 75 with other risks: Coumadin

(4) Age greater than 75 with or without other risks: Coumadin

E. Cigarette *Smoking*

1. Background

    a) Risk

        (1) Risk of stroke is doubled

        (2) Most of this risk is eliminated by 18 months after smoking cessation

    b) Currently available treatments

        (1) Support groups / programs

        (2) Nicotine replacement therapy

        (3) Medication (e.g. bupropion)

2. Recommendations

    a) Diagnosis

        (1) Inquire about patient's habits

    b) Treatment

        (1) Counsel patient on risks of smoking

        (2) With tobacco users willing to quit, utilize the 5 "A's.": Ask, Advise, Assess, Assist and Arrange

        (3) With tobacco users unwilling to quit, use the 5 "R's": Relevance, Risks, Rewards, Roadblocks, and Repetition

        (4) Develop a plan to quit with the patient

            (a) Set a quit date

            (b) Discuss methods for overcoming cravings

            (c) Identify potential support system (e.g. family, friends)

            (d) Provide informational resources

F. Sickle Cell Anemia *(SCA)*

1. Background

    a) Risk

        (1) 15 to 25% of patients with SCA will have TIA or stroke

        (2) Hemorrhage stroke is more common in adults

        (3) Ischemic stroke is more common in children with a risk of 1% per year

(a) Patients with transcranial doppler evidence of high cerebral blood flow velocity have stroke rates of 10% per year

b) Currently available treatment

(1) Transfusion therapy

(2) Hydroxyurea and bone marrow transplant are currently under investigation in high risk patients requiring long term intervention

2. Recommendations

a) Diagnosis

(1) Children with sickle cell disease over 2 years of age should be screened with transcranial doppler at 6 month intervals.

(2) Transcranial doppler in patients with symptoms suggestive of TIA or stroke, or in patients with evidence of vaso-occlusive disease in other organs

b) Treatment

(1) Exchange transfusion

(a) Patients with 2 abnormal transcranial doppler studies (mean velocity of > 200 cm/sec)

(b) Patients with evidence of TIA or stroke clinically or radiologically

(2) Life-style changes in at-risk patients

(a) Avoid excess unaccustomed exertion

(b) Avoid hypoxia (e.g. altitudes)

(c) Avoid exposure to excessive heat

(d) Avoid exposure to infection

G. History of TIA or stroke

1. Background

a) Risk

(1) Up to 10% of patients with a cerebral ischemic event will have a stroke within one month if untreated

(2) Up to 15% of patients with a cerebral ischemic event will have a stroke within one year if untreated

(3) Up to 40% of patients with a cerebral ischemic event will have a stroke within 5 years if untreated

b) Currently available treatment (excluding atrial fibrillation)

(1) Aspirin

(2) Clopidrogel (Plavix)

(3) Aspirin/dipyridamole (Aggrenox)

(4) Ticlopidine (Ticlid)

(5) Carotid endarterectomy or stenting (see Guidelines for TIA)

2. Recommendations

a) Diagnosis

(1) History

(2) Physical exam

(3) Imaging

(a) Carotid doppler

(b) Echocardiography

(c) MRI brain with diffusion weighted imaging

b) Treatment

(1) If no prior prophylaxis, 75 to 325 mg aspirin once daily

(2) If evidence of cardiovascular or peripheral vascular disease with or without prior prophylaxis, or with allergy to aspirin, 75 mg clopidrogel (Plavix) once daily (unless you need ASA + clopidrogel (Plavix) for cardiac reasons)

(3) If prior prophylaxis with aspirin or clopidrogel (Plavix); aspirin/dipyridamole (Aggrenox) twice daily

(4) If prior prophylaxis with aspirin/dipyridamole (Aggrenox), 250 mg ticlopidine (Ticlid) twice daily (follow CBC and SGOT every other week for first 3 months)

(5) If prior prophylaxis with ticlopidine (Ticlid), consider Coumadin if otherwise not contraindicated

H. *Diabetes mellitus*

1. Background

a) Risk

(1) Increases risk of stroke by 1.4 to 1.7 times

(2) No data has indicated that tight control of diabetes decreases the risk of stroke

b) Currently available treatment

(1) Diet

(2) Insulin

(3) Oral hypoglycemics

c) Recommendations

(1) Check fasting blood sugar in individuals with or without family history every 3 years starting at 45 years of age

(a) If other risk factors for diabetes, may need earlier or more frequent screening on a case-by-case basis

(2) Maintain fasting blood sugar less than 120 mg/dl

(3) Maintain glycosylated hemoglobin less than 7%

(4) Monitor lipids annually

(5) Initiate life-style changes: diet, exercise, weight loss

I. Hyperhomocysteinemia

1. Background

a) Risk

(1) A 5 micromol/liter increase in serum homocysteine is associated with an increased risk of stroke by 1.5 times

(2) This risk may increase to 3 times in patients with pre-existing vascular disease (i.e. cardiac, peripheral, or cerebral)

(3) Association between homocysteine and stroke is less clear in otherwise healthy individuals

b) Currently available treatment

(1) Vitamin therapy (i.e. folate, pyridoxine, and cobalamin)

(a) Clearly reduces homocysteine levels in serum

(b) Less consistent evidence that this decrease actually lowers risk of stroke

2. Recommendations

a) Diagnosis

(1) Serum homocysteine levels in patients with documented vascular disease (e.g. MI, claudication, TIA/stroke) at least once

b) Treatment

(1) The combination of:

(a) Folic acid: 2-5 mg per day

(b) Pyridoxine: 25-50 mg per day

(c) Cobalamin: 0.4 to 4 mg per day

(2) Clinician must consider potential problems for patient (e.g. financial) when using such treatment with controversial impact

IV. Less well documented risk factors

A. Cholesterol and lipids

1. Background

a) Early studies did not indicate a relationship between cholesterol and stroke

(1) It appears that the relationship between cholesterol and stroke may be dependent on the etiology of the stroke and the characteristics of patient (i.e. gender, race)

b) More recent data is beginning to describe possible relationships, but it is very complicated

(1) Variability with respect to gender and age

(2) Variability with respect to type of lipid (e.g. total cholesterol, HDL, LDL, triglycerides)

2. Recommendations

a) Check lipid profile as routine wellness care on all patients

b) Intervene

(1) Total cholesterol: probably not factor

(2) Triglycerides: greater than 150 mg/dl

(3) HDL: less than 40 mg/dl

(4) LDL: greater than 100 mg/dl

c) Intervention

(1) Diet

(2) Medication

(3) Physical activity

B. Other cardiac disease

1. Background

a) Multiple cardiac abnormalities have been implicated in the increased risk for stroke, including: cardiomyopathy, patent foramen ovale, mitral annular calcifications, aortic stenosis, nonbacterial endocarditis, segmental wall motion abnormalities, atrial septal aneurysm

b) Suggestive data is predominantly retrospective, and some is specific to certain populations

c) Very little data is available regarding prophylactic treatment in these situations

2. Recommendations

a) If any suspicion of cardiac disease, consult a cardiologist

b) When any of these situations are present in a patient, preventative treatment should be tailored to each patient considering the patient's overall condition and possible presence of other risk factors

C. Obesity

1. Background

a) Increases all cause mortality and morbidity from many other medical problems

b) Obesity increases risk of developing other risk factors for stroke including hypertension, diabetes mellitus and hyperlipidemia

c) Some prospective population studies have demonstrated obesity as an independent risk factor for stroke, (especially abdominal obesity)

d) No studies have yet shown a reduction of stroke risk with demonstrated weight loss

2. Recommendations

a) Body mass index should be below 30kg/m2 (ideally 21 to 25 kg/m2)

b) Do not ignore obesity as a medical problem

c) Dietary restriction and increased physical activity should be recommended

d) Behavioral therapy should be used to manage other issues contributing to obesity (e.g. stress management, problem solving, self-monitoring, and social support)

e) Pharmacotherapy and surgery may be considered in the more severe cases as medically indicated

D. Physical inactivity

1. Background

a) Several prospective population studies have indicated an inverse relationship between the level of physical activity and occurrence of stroke

b) The benefit of physical activity is most likely related to its direct effect of other risk factors, including hypertension, diabetes mellitus, lipid levels, and coagulation

c) Moderate activity is as effective as heavy activity perhaps with less risk

2. Recommendations

a) 30 minutes of moderate activity (e.g. brisk walking) or 45-60 minutes of total activity at least 5 days per week

b) Walk 10,000 steps per day most days of the week

c) Consider cardiac stress testing at risk patients before implementing an exercise program

d) Tailor exercise to limitations of patient's overall condition

E. Oral contraceptives / hormone replacement therapy

1. Background

a) Earlier contraceptive formulations (i.e. estrogen content greater than 50 mcg) were strongly associated with risk of stroke

b) Low-dose contraceptives have not been shown to increase the risk of stroke

c) Hypertension and tobacco use further increase the risk of stroke in patients using contraceptives

d) Evidence suggests that hormone replacement therapy in post-menopausal women may result in a slight increase in the risk of stroke

2. Recommendations

a) Use contraceptive formulations with less than 50 mcg of estrogen

b) Avoid use of contraceptives in patients with hypertension or who use tobacco

c) Hormone replacement therapy should <u>not</u> be used to decrease the risk of stroke in post-menopausal women

F. Alcohol/illicit drugs

1. Background

a) Data suggest one to two alcoholic drinks per day may protect against stroke

b) More than 4 to 5 drinks per day may increase risk of stroke

c) Drugs such as heroine, cocaine, amphetamines, phencyclidine can lead to stroke via vasculitis, vasospasm, vasculopathy, arrhythmias, hypercoagulability, and hypertensive crisis

2. Recommendations

a) No more than 2 alcoholic beverages per day for men and no more than one per day for women

b) Educate patients on risks of stroke associated with drug use

c) Alcohol and drug treatment programs for those patients unable to control abuse

G. Hypercoagulability / inflammation

1. Background

a) Hypercoagulable states have been associated with increased risk of stroke, including lupus anticoagulant, anticardiolipin antibodies, and deficiencies of protein C, protein S, and antithrombin III

b) Inflammatory conditions which affect blood vessels have also been associated with increased risk of stroke, including lupus, isolated CNS angiitis, temporal arteritis, Takayasu arteritis

c) Treatment is directed toward the primary disorder

d) Many of these disorders are inherited as well as acquired

2. Recommendations

a) When positive family history, test patient for presence of disorder even if no symptoms are apparent yet

(1) Check for family history of other thrombotic events (e.g., recurrent miscarriages, DVT)

(2) Hematology consult for coagulopathies

(3) Rheumatology consult for inflammatory diseases

H. Obstructive sleep apnea syndrome (OSA)

1. Background

a) Prevalence of sleep apnea has been shown to be between 10% and 30% of the population over the age of 20 years

b) Has been shown to adversely affect other know risk factors for stroke, including: hypertension, cardiac dysrhythmias, other cardiac dysfunction

c) Has been shown to have a markedly increased prevalence in patients with TIA and stroke independent of other known risk factors

d) The actual direction of cause and effect (although implied by several studies) has not yet been conclusively supported by controlled prospective studies

e) Suggested mechanisms for increasing risk of stroke

(1) Increased sympathetic activity (e.g. hypertension, dysrhythmia)

(2) Abnormal cerebral hemodynamics (e.g. increased intracranial pressure, altered vascular response to blood gases)

(3) Endothelial dysfunction (e.g. atherosclerosis)

(4) Increased coagulability (e.g. platelets, fibrinogen)

2. Recommendations

a) Ask patients about symptoms of OSA even if they do not complain

(1) Snoring

(2) Excessive daytime sleepiness

(3) Apnea witnessed by sleep partner

b) Especially consider patients with risk factors

(1) Obesity

(2) Male gender

(3) Increasing age

(4) African-American heritage

(5) Post-menopausal female

c) Order overnight polysomnography

(1) When any of above-mentioned symptoms are present

(2) Treatment – resistant hypertension

d) If OSA documented with testing, consult a board certified sleep specialist

These guidelines are intended to be a basis from which patient care may be individualized for each patient's situation. Diagnostic and therapeutic procedures and medical treatments are continuously being evaluated and improved. Experience varies with different procedures. Therefore, some procedures require more stringent limitations to their utilization than others based on experience and application. The practice of medicine is continuously changing. These guidelines are particularly pertinent for the point in time during which they have been published. Advancement in medical techniques will necessarily update the propriety of these recommendations.

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GUIDELINES FOR THE DIAGNOSIS AND TREATMENT OF TRANSIENT ISCHEMIC ATTACK (TIA)

Purpose: To provide a basis from which the medical community in the state of Indiana may more reliably recognize that a patient may have had a TIA. To outline an appropriate course for evaluation of such a patient in order to differentiate from other possible diagnoses and determine the cause of an identified TIA. To provide a minimum standard from which the treatment of a patient with a TIA may proceed in order to prevent recurrence or the progression to stroke.

Introduction

I.Definition

A. Transient neurologic deficit classically defined as less than 24 hours in duration

B. In most cases the deficit lasts less than an hour

C.The advent of MRI diffusion weighted imaging allows us to determine if a stroke has occurred (i.e. permanent brain injury)

D.Some patients with a stroke may have only transient symptoms

E.TIA occurs when blood flow in the brain does not fall below a critically low threshold before normal flow is restored

II.Etiologies

A.Cardiac: emboli to smaller blood vessels (20-30%)

B.Large vessel, extracranial: generally emboli to smaller vessels, but may also be transient occlusion such as dissection or emboli from heart in combination with local atherosclerosis (15-20%)

C.Large vessel, intracranial: same as large vessel, extracranial (5-8%)

D.Small vessel, intracerebral: atherosclerosis; emboli from larger vessels or heart (up to 20%)

E.Blood: coagulopathies (1-5%)

III.Symptoms

A. Unilateral sensory or motor impairment

B. Gait disturbance

C. Trouble with speech or language

D. Dizziness

E.Visual changes

F.Confusion

IV.Risk factors

A.Hypertension

B.Diabetes mellitus

C.Coronary artery disease

D.Atrial fibrillation

E.Carotid artery stenosis

F.Tobacco use

G.Cholesterol

H.Others (see Guidelines for Risk Factors for Stroke)

V.Differential Diagnosis

A.Seizure

B.Migraine equivalent

C.Metabolic disturbance (e.g. hypoglycemia)

D.Vestibulopathy

E.Cerebral vessel aneurysm

F.Ocular disorders

G.Hyperventilation

VI.Diagnosis

A.History

B.Time course

a)Onset

(1)Immediate maximal deficit suggests emboli

(2)Stuttering course of progressive deficit suggests small vessel atherosclerosis

(3)Symptoms occur simultaneously in all affected areas

b)Duration

(1)Less than one hour

C.Symptoms

a)Negative phenomena (i.e. lost of function)

2.Associated factors

a)Provocation

(1)Generally none for TIA which may occur under any set of circumstances

b)Other symptoms

(1)If present, typically indicate diagnosis other than TIA

(a)Syncope – cardiac problem, hypotension

(2)Incontinence – seizure

(3)Headache – migraine, cerebral aneurysm

D.Physical examination

E.Comprehensive neurological examination

a)May be normal

b)If neurologic deficit still detectable, patient may have had a stroke

c)Findings on examination can help localize affected vascular territory

F.General examination

a)Vital signs

(1)Blood pressure

(2)Heart rate

(3)Respiratory rate

(4)Temperature

(5)Oxygen saturation

2.Cardiac examination

a)Irregular rhythm

b)Murmurs

G.Neck

a)Carotid bruits

H.Testing

I.Laboratory

a)Hematologic

(1)CBC

b)Metabolic

(1)Electrolytes, BUN, creatinine, and glucose

(2)Lipid profile

(3)Serum homocysteine level

2.Inflammatory

a)Sedimentation rate

b)Syphilis serology

c)Serum protein electrophoresis

3.Immunologic

a)Anticardiolipin antibody

b)Lupus anticoagulant

c)Antiphospholipid

4.Coagulation

a)Protime, PTT

b)Protein C & S

c)Antithrombin III

d)Leiden factor V

5.ECG

J.Imaging options

1.Brain

a)MRI

b)CT

2.Cerebral vasculature

a)Carotid doppler

b)Magnetic resonance angiography

c)CT angiography

d)Conventional angiography

3.Heart

a)Echocardiography

b)Transesophageal echocardiography

VII.Treatment

A.The prevention of recurrent cerebral ischemic events

B.Medical

1.Antiplatelet medication

a)Aspirin

b)Clopidogrel (Plavix)

c)Ticlopidine (Ticlid)

d)Aspirin/extended release dipyridamole (Aggrenox)

2.Anticoagulation

a)Heparin

b)Coumadin

3.Metabolic

a)Folic acid, vitamins B12 and B6

4.Surgical/Interventional

a)Carotid endarterectomy

b)Carotid angioplasty/stenting

VIII.Recommendations

A.Pre-hospital

1.Patient education

a)What patients need to know

(1)Risk factors for stroke

b)Symptoms of stroke

c)Actions to take in event of suspected stroke

(1)Seek medical attention immediately

(a)Call 911

2.How to educate patients

a)Primary physician

(1)Learn patients' habits and risks

(2)Communicate these to patient

b)Hospitals

(1)Educational programs

(2)Stroke support groups

(3)Screening sessions for risk factors

3.Special interest groups (i.e. American Stroke Association and National Stroke Association

(1)Educational programs

(2)Screening sessions

(3)Literature

B.Emergency Medical System

1.Recognition

a)Dispatch

(1)Should be able to recognize suspicious complaints as possible stroke symptoms

(a)Confusion

(b)Weakness

(c)Falling

(d)Dizziness

(2)Should communicate possibility of stroke to emergency personnel in field

b)On site

(1)Cincinnati pre-hospital stroke scale

(a)Language

(b)Facial weakness

(c)Arm weakness (drift)

(2)Awareness of other conditions similar to stroke

(a)Seizure

(b)Hypoglycemia

(c)Hyperventilation

2.Management

a)On site

(1)Check vital signs

(2)Intervene with any life threatening conditions

(3)Consider oxygen administration if oxygen saturation is less than 93%

(4)Obtain history

(a)Time of onset

(b)Type of onset: gradual vs. abrupt

(c)Onset while awake or asleep

(d)Duration of symptoms

(e)Nature of symptoms

3.Transport

a)As soon as possible

b)Start intravenous access

c)Nothing by mouth

d)Contact ER destination and notify nature of problem and estimated time of arrival

e)Check blood sugar by finger stick

f)Place patient on cardiac monitor

4.Transfer to ER care

a)Provide information

(1)Time of symptom onset

(2)Symptoms

(3)Findings of examination

*(4)*Provide medication list

C.In primary care physician's office or urgent care center

1.Patient presents with report of a transient neurologic deficit more than two weeks earlier

a)If patient not previously taking aspirin and it is not otherwise contraindicated, start 325 mg aspirin daily

2.Patient presents with report of a single transient neurologic deficit within prior two weeks

a)If patient not previously taking aspirin and it is not otherwise contraindicated, start 325 mg aspirin daily

b)Order CT of brain within 24 hours

c)Electrocardiogram within 24 hours to rule out atrial fibrillation

d)Order carotid doppler

e)Order echocardiogram

f)Obtain neurology consult within one week

3.Patient presents with report of multiple recurrent transient neurologic deficits up to the prior 24 hours

a)If patient not previously taking aspirin and it is not otherwise contraindicated, start 325 mg aspirin daily

b)Immediate electrocardiogram to rule out atrial fibrillation

c)Immediate neurology consultation

D.Emergency Room

1.Contact with EMS

a)Time of symptom onset

b)Identify symptoms

c)Stability of patient

d)Medications

2.Triage

a)Recognize symptoms of walk-in patients

b)Determine time of onset of symptoms

3.Evaluation

a)Examination

b)Labs

(1)Finger stick blood sugar

(2)CBC

(3)Electrolytes, BUN, creatinine, and glucose

c)Imaging

(1)CT brain

d)ECG

4.Treatment

a)Aspirin (325 mg)

(1)If no medical contraindication

(2)If no hemorrhage on head CT

(3)If patient can safely swallow

b)Clopidrogel (Plavix) 75 mg

(1)If contraindication to aspirin

(2)If patient was already on aspirin

5.Disposition

a)Neurology consultation

E.Post Emergency Room

1.Evaluation

a)Dependent on clinical localization of event

(1)Anterior circulation (i.e. carotid distribution)

(a)Carotid doppler

(b)Echocardiogram

(c)MRI with diffusion – weighted imaging

(2)Posterior circulation (i.e. vertebro-basilar distribution)

(a)MRI with diffusion

(b)MR angiography

(c)Echocardiogram

(3)Subcortical lacunar syndrome

(a)MRI with diffusion – weighted imaging

(b)Carotid doppler

2.Dependent on suspected etiology

a)Aortic disease

(1)Transesophageal echocardiogram

b)Coagulopathy

(1)Protein C&S

(2)Antithrombin III

(3)Leiden Factor V

c)Inflammation

(1)Sedimentation rate

(2)Syphilis serology

(3)Serum protein electrophoresis

d)Immunologic

(1)Anticardiolipin antibody

(2)Lupus

(3)Antiphospholipid antibodies

e)Metabolic

(1)Serum homocysteine level

(2)Fasting blood sugar

(3)Lipid profile

F.Management

1.Nursing (if patient admitted to hospital)

a)Assess and monitor neurological status for further signs and symptoms of neurological dysfunction

b)Assess patient and family for baseline knowledge level of risk factors, diagnostic tests, medications, and surgical therapies

c)Facilitate and educate the patient and family according to assessment of knowledge deficit appropriate to the patient's educational level and learning style

(1)Blood pressure control

(2)Stop smoking

(3)Control diabetes

(4)Limit alcohol intake

(5)Monitor blood lipid levels

(6)Regular physical activity

(7)Stop illicit drug use

(8)Well balanced diet

d)Education materials may include:

(1)Printed material on specific medications

(2)Videos on medication/procedures

(3)Recommended websites

(4)Printed material about the warning signs of stroke

e)Consult dietician / diabetes educator

2.Medical

a)Identification of risk factors

(1)Obtain additional history

(a)Past medical history of conditions that could increase the risk of stroke (e.g. hypertension, diabetes, atrial fibrillations, coronary artery disease and hypercholesteralemia)

(b)Identify habits (e.g. tobacco, alcohol/illicit drug, diet and exercise)

(c)Family history of stroke or coagulation disorders

(2)Evaluate blood pressure trends

(3)Check metabolic status

(a)Fasting glucose

(b)Fasting lipid profile

(c)Serum homocysteine level

b)Treatment of risk factors

(1)Hypertension

(2)Prehypertension: systolic blood pressure 120-139 mm Hg; diastolic blood pressure 80-89 mm Hg;

(a)Recommend lifestyle changes

(b)Closer monitoring of blood pressure

(3)Blood pressure greater than 140/90 mm Hg

(a)Initiate medication with consideration of patient’s overall conditions

(4)Diabetes mellitus

(a)Maintain fasting blood sugar less than 120 mg/dl

(b)Maintain glycosylated hemoglobin less than 7%

(c)Monitor lipids annually

(d)Initiate lifestyle changes: diet, exercise, and weight loss

(5)Hypercholesterolemia

(a)Maintain tryglycerides less than 150 mg/dl

(b)Maintain LDL less than 70 mg/dl (ideally)

(c)Intervention may require medication

(6)Tobacco

(a)Smoking cessation program

(7)Serum homocysteine level

(a)Folic acid, vitamins B12 and B6

c)Treatment of etiology

(1)Atrial fibrillation

(a)Start Coumadin since patient now has risk factors for stroke in addition to atrial fibrillation (brand-name Coumadin is recommended due to potential variability with multiple available generic products)

(b)Other risks may preclude use of Coumadin (e.g. recurrent GI bleeding, recurrent falls)

(2)Carotid stenosis (symptomatic by definition since patient has had TIA)

(a)Stenosis less than 50%: antiplatelet agents

(b)Stenosis greater than 50% in men and 70% in women

- Consider carotid endarterectomy at institution with surgical risk of stroke and death of less than 3%

- Consider carotid artery stenting in patients with restenosis after prior carotid endarterectomy, poor cardiac status, prior neck irradiation, difficult surgical access or high anesthetic risk (procedure should be performed at facility designated as a comprehensive stroke center by interventionalists certified to perform this procedure)

(3)Intracranial vascular disease

- Antiplatelet agents

  (a)Aspirin: if first event

  (b)Aspirin/dipyridamole (Aggrenox): if event occurred while patient on aspirin

  (c)Ticlopidine (Ticlid): if event occurred while patient aspirin/dipyridamole (Aggrenox)

- Clopidrogel (Plavix): if patient also has documented coronary or peripheral vascular disease or is allergic to aspirin

- Angioplasty or stenting may be appropriate in specific research settings

(b)Coagulation disorders

- Coumadin is generally indicated

- Consult hematologist

G.Long term

1.Follow up care

a)Managed by primary care physician or neurologist

b)Reinforce risk leading to individual patient's event

c)Management of risk factors

(1)Medical treatment as outlined above

(2)Monitor appropriate parameters

d)Management of lifestyle

(1)Tobacco

(a)Monitor abstinence

(b)Support

e)Physical activity

(a)Encourage maintenance program

(b)Tailor to patient's physiologic status

f)Diet

(a)Consult with nutritionist

2.Other monitoring

a)Carotid doppler

(1)Yearly if greater than 50% originally

b)Labs

(1)Serum homocysteine level 3 months after initiation of treatment

(2)Blood glucose at frequency dependent on diabetic status

(3)Lipids yearly

(4)Coagulation parameters if implicated in original event

c)Symptoms

(1)Report of patient

(2)Report of family / caretakers

These guidelines are intended to be a basis from which patient care may be individualized for each patient's situation. Diagnostic and therapeutic procedures and medical treatments are continuously being evaluated and improved. Experience varies with different procedures; therefore, some procedures require more stringent limitations to their utilization than others based on experience and application. The practice of medicine is continuously changing. These guidelines are particularly pertinent for the point in time during which they have been published. Advancement in medical techniques will necessarily update the propriety of these recommendations.

Suggested reading:

Albers, G.W. & J.D. Easton. "Managing TIA: The Current Clinical Strategies." Transient Ischemic Attack. Disease Management Guide. Medical

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Flemming, K.D., et.al. "Evaluation and Management of Transient Ischemic Attack and Minor Cerebral Infarction." Mayo Clinic Proceedings. 79: 1071-1086. (2004).

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GUIDELINES FOR THE DIAGNOSIS AND TREATMENT OF ISCHEMIC STROKE

Purpose: To provide a basis from which the medical community in the state of Indiana may more reliably and efficiently recognize that a patient with ongoing neurologic deficit may be in the midst of a stroke. To outline an appropriate course for the evaluation of such a patient in order to differentiate other possible diagnoses as well as to determine the cause of an identified stroke. To provide a minimum standard from which the immediate and long-term management of a patient with a stroke may proceed in order to maximize functional recovery, minimize complications, and prevent recurrence.

I. Definition

A. Neurological defect lasting more than 24 hours

B. The advent of MRI diffusion weighted imaging allows determination of permanent brain injury regardless of the duration of clinical symptoms

C. A stroke occurs when blood flow in the brain falls below a critical level whether or not normal flow is subsequently restored

II. *Epidemiology*

A. Stroke is the 3rd leading cause of death in the U.S.

B. Stroke is the leading cause of disability and long-term institutionalized care in the U.S.

C. Approximately 600,000 new and recurrent strokes occur in the U.S. per year

D. The direct and indirect costs of stroke exceed $50 billion per year in the U.S. ($300 million in hospital charges in Indiana)

E. Indiana has the 7th highest rate of stroke in the U.S.

III. *Etiology*

A. Cardiac: emboli to smaller vessels (20-30%)

B. Large vessel, extracranial: generally emboli to smaller vessels, but may also be transient occlusion such as dissection or emboli from heart in combination with local atherosclerosis (10-20%)

C. Large vessel, intracranial: same as large vessel, extracranial (5-8%)

D. Small vessel, intracerebral: atherosclerosis, emboli from larger vessels or heart (up to 20%)

E. Blood: coagulopathies (1-5%)

F. Cryptogenic: undetermined etiology (20-35%)

IV. *Signs and Symptoms*

A. Unilateral sensory or motor impairment

B. Gait disturbance

C. Trouble with speech or language

D. Dizziness

E. Visual changes

F. Confusion

V. *Risk Factors*

A. Hypertension

B. Diabetes mellitus

C. Coronary artery disease

D. Previous TIA

E. Atrial fibrillation

F. Carotid artery stenosis

G. Tobacco use

H. Elevated cholesterol

I. Others (see Guidelines for Risk Factors of Stroke)

VI. *Differential Diagnosis*

A. Seizure

B. Migraine

C. Metabolic disturbance (e.g. hypoglycemia)

D. Subdural hemotoma

E. Brain tumor

F. Trauma

G. Intoxication

H. Brain infection (e.g. abscess, encephalitis)

VII. Diagnosis

A. History

1. Significance

a) Differentiates stroke from other possible diagnoses

b) Localizes area of brain affected and involved circulation (e.g. carotid vs. basilar arteries)

c) Helps to determine possible cause (e.g. embolus vs. thrombosis)

2. Time course

a) Onset

(1) Immediate maximal deficit suggests embolus

(2) Stuttering course of progressive deficit suggests small vessel atherosclerosis

(3) With stroke, symptoms occur simultaneously in all affected areas

b) Duration

(1) Symptoms lasting longer than one hour

3. Symptoms

a) Usually negative phenomena (i.e. loss of function)

4. Associated factors

a) Provocation

(1) Activity – usually embolic source

(2) Sleep – usually thrombotic source

b) Other symptoms

(1) If present, typically indicate diagnosis other than stroke

- Syncope – cardiac problem, hypotension
- Incontinence – seizure
- Headache – migraine, cerebral aneurysm

(2) Symptoms occasionally associated with stroke

- Vomiting – brainstem involvement
- Seizure – embolic stroke

B. Physical Examination

1. Comprehensive neurologic examination

a) Level of consciousness

b) Neurologic deficits

(1) Cincinnati pre-hospital stroke scale is easy to perform and has a high degree of reliability in predicting if a patient is actually experiencing a stroke (Appendix 1)

- Ideal for use by EMS and ER personnel for rapid assessment

(2) NIH stroke scale can be helpful in quantitating overall deficit and subsequent progress (Appendix 2)

c) Examination findings can help localize affected vascular territory

2. General examination

a) Vital signs

b) Overall examination to determine comorbid conditions which could lead to impaired recovery

3. Cardiac examination

a) Rhythm disturbance

b) Murmurs

4. Neck

a) Carotid bruits

C. Testing (will depend on circumstances)

1. Laboratory

a) Hematologic

(1) CBC

b) Metabolic

(1) Electrolytes, BUN, creatinine, glucose

(2) Lipid profile

(3) Serum homocysteine level

c) Inflammatory

(1) Sedimentation rate

(2) Syphilis serology

(3) Serum protein electrophoresis

d) Immunologic

(1) Anticardiolipin antibody

e) Lupus anticoagulant

f) Antiphospholipid antibody

2. Coagulation

a) Protime, PTT

b) Protein C&S

c) Antithrombin III

d) Leiden factor V

3. Electrocardiogram

4. Imaging

a) Brain

(1) MRI

(2) CT

b) Cerebral vasculature

(1) Carotid doppler

(2) MR angiography

(3) CT angiography

(4) Conventional angiography

c) Heart

(1) Echocardiography

(2) Transesophageal echocardiography

VIII. Treatment

A. Immediate treatment

1. Intravenous tissue-type plasminogen activator (TPA)

a) Mechanism of action

(1) Degradation of thrombus in artery

(2) Conversion of plasminogen to plasmin which cleaves the fibrin matrix of the thrombus

b) Dosing and administration

(1) 0.9 mg/kg maximum of 90 mg)

(2) 10% of dose given as intravenous bolus over one minute

(3) The remaining 90% of dose is administered intravenously over 60 minutes

c) Inclusion criteria

(1) Symptom onset less than 3 hours prior to administration of TPA

(2) No evidence of intracranial hemorrhage on CT scan of brain

(3) NIH stroke scale score between 4 and 20

d) Exclusion criteria

(1) Active bleeding

(2) Systolic blood pressure greater than 185 mmHg or diastolic blood pressure greater than 110 mmHg

(3) Aggressive treatment required to reduce blood pressure to specified limits

- Sodium nitroprusside

(4) Rapidly improving or minor symptoms

(5) Seizure at onset of stroke

(6) Symptoms of subarachnoid hemorrhage

- Severe headache

(7) Prior intracerebral hemorrhage felt to predispose patients to high risk of recurrence

(8) Stroke or head trauma in previous 3 months

(9) Myocardial infarction in previous 3 months

(10) Major surgery or other serious trauma in previous 2 weeks

(11) Gastrointestinal or urinary tract hemorrhage in previous 3 weeks

(12) Arterial puncture at a noncompressible site in previous 7 days

(13) Use of oral anticoagulants or intravenous heparin in previous 48 hours

(14) INR greater than 1.5 or elevated PTT

(15) Platelet count less than 100,000/mm3

(16) Glucose less than 50 mg/dl or greater than 400 mg/dl

(17) Pregnancy or lactation

(18) Obtunded or comatose patient

(19) Evidence of ischemic involvement of more than 1/3 of a cerebral hemisphere

2. Alternative procedures

a) Types

(1) Intraarterial thrombolytics

(2) Intraarterial mechanical thrombectomy

b) Have been shown to improve outcome in selected patients

(1) Documented arterial occlusion by angiographic procedure

(2) More than 3 hours since onset of symptoms

c) Experimental procedures

d) Hypothermia

e) Desmoteplase

B. Prophylactic treatment

1. Antiplatelet medication

a) Aspirin

b) Clopidogrel (Plavix)

c) Ticlopidine (Ticlid)

d) Aspirin/extended release dipyridamole (Aggrenox)

2. Anticoagulation

a) Heparin

b) Warfarin (Coumadin)

3. Metabolic

a) Folic acid / B complex

4. Surgical / interventional

a) Carotid endarterectomy

b) Carotid stenting / angioplasty

IX. Rehabilitation (2/3 of persons who have stroke need rehabilitation)

A. Goals for rehabilitation of stroke patients

1. Training for maximum recovery

2. Prevent and treat comorbid conditions

3. Enhance psychosocial coping

4. Promote reintegration into the community

5. Prevent recurrent strokes and other vascular events

6. Improve quality of life

B. Factors for Successful Rehabilitation

1. The timing of rehabilitation

2. Extent of brain injury

3. Survivor's attitude

4. Skill of the rehabilitation team

5. Cooperation of family and friends

C. Settings for Rehabilitation

1. Acute care hospital for initial care and stabilization 24-48 hours after stroke

2. Acute rehabilitation unit or freestanding hospital provides therapy for a minimum of 3 hours per day 5-6 days per week

3. Long-term acute care hospital for complex medical needs provides no therapy or 1-2 hours per day

4. Subacute rehabilitation unit either hospital-based or in a skilled facility

5. Home-based nursing care and therapy provides necessary staff for 2-3 visits per week

6. Outpatient therapy services provided 2-3 days per week

7. Day treatment provides 2-3 therapies and groups 4-6 hours/day for 3-5 days/week

D. Medical Professionals Involved in Rehabilitation Care

1. Physician: physiatrist or neurologist

2. Training and experience in general medicine as well as neurology or physical medicine and rehabilitation with certification

3. Rehabilitation nursing

4. Prevention of medical complications, education, and supervision to maximize patient abilities and self-care potential

5. Focus on medical conditions, elimination, medication knowledge, skin integrity, safety

6. Physical therapy

7. Improvement in strength, coordination and endurance

8. Improvement in skills needed for mobility

9. Recommend and instruct in use of appropriate bracing and assistive devices

10. Establish exercise programs

11. Occupational therapy

12. Evaluate and treat deficits in daily living skills, eye-hand coordination and homemaking

13. Improvement in general strength and upper extremity function

14. Assess and devise plans to address safety, architectural barriers, and adaptive equipment needs

15. Address energy conservation and work simplification

16. Recreational therapy

17. Reinforcement of socialization skills and improvement of self esteem

18. adaptive equipment and techniques for leisure time

19. Provide community reintegration programs to allow for practice of skills

20. Speech language pathology

21. Evaluate and treat speech, language, cognition and swallowing deficits

22. Perform swallowing evaluations and recommend compensatory strategies

23. Treat problem solving and memory deficits

24. Implement alternative means of communication

25. Psychology / Neuropsychology

26. Provide individual, family, and group counseling to aid in adjusting to disability

27. Neuropsychology testing to identify cognitive deficits

28. Oversight of behavioral modification programs, if necessary

29. Social worker / Case manager

30. Oversight of the discharge plan

31. Identification and referral to needed community resources, financial assistance, and continuing health services

E. Types of Disabilities

1. Physical

2. Paralysis – hemiplegia or hemiparesis

3. Problems controlling movement (ataxia)

4. Affects range of motion, activities of daily living, transfers, mobility

5. Visual/perceptual – hemianopsia or neglect

6. Swallowing – dysphagia

7. Incontinence

8. Sensory

9. Paresthesia

10. Pain (thalamic pain syndrome)

11. “Frozen” joints

12. Language

13. Understanding – receptive aphasia

14. Expression – expressive aphasia

15. Global aphasia

16. Thinking and memory

17. Short term memory loss

18. Attention and concentration

19. Sequence/planning – apraxia

20. Emotional

21. Depression

22. Lability

23. Anger/frustration

24. Impulsivity; poor judgment

25. Relationships; intimacy

26. Vocational / Avocational

27. Driving

28. Return to work/accommodations

29. Community re-entry

F. Commission on Accreditation of Rehabilitation Facilities (CARF) accredits stroke specialty programs indicating optimal performance in post-acute rehabilitation settings

1. Stroke specialty rehabilitation programs provide services that focus on prevention, on minimizing impairment, on reducing activity limitations, and on maximizing the participation and quality of life of persons who have sustained a stroke

2. Many organizations use CARF standards, but due to the involved costs, do not pursue its certification

X. Hospital systems

A. Within the hospital

1. Stroke protocol/pathways (Appendix 3)

a) A standardized set of instructions for the management of a patient with ischemic stroke

(1) For evaluation of patient

(2) For treatment of stroke

(3) For secondary prevention of stroke

- Identification and treatment of risk factors

(4) For nursing management

b) May include standing orders

(1) For administration of TPA

(2) For management of patient following TPA

(3) For subacute management of patient regardless of use of TPA

c) Much documentation exists indicating improved patient outcomes when stroke protocols are in use

(1) Increase use of select medications and treatments

(2) Improved patient assessment

(3) Reduction in unnecessary tests

(4) Shorter length of stay

2. Stroke teams

a) Provide evaluation of the patient by designated staff with experience in the diagnosis and management of stroke

b) Composition (varies depending on the facility)

(1) Neurologist

(2) Neurosurgeon

(3) Emergency physician

(4) Radiologist

(5) Registered nurse

(6) Radiology technician

(7) Pharmacist

c) Mechanism

(1) Members carry pager for rapid activation of the team

(2) Once activated, the members of the team are available for communication in their respective departments (e.g. radiology, technician prepared for CT, pharmacist available to rapidly dispense TPA

(3) Members of team may be rotated on predetermined schedule

- Reduces interference with other duties
- Enables participation and cooperation among all appropriate medical staff members

(4) Response should be within 15 minutes

(5) Availability should be 24 hours daily

B. Stroke centers

1. Purpose

a) To provide a cohesive infrastructure in a health care facility for the optimal management of patients with stroke

2. Primary stroke center

a) Capabilities

(1) Assess and diagnose patients with stroke

(2) Stabilize patient

(3) Provide emergency care including TPA if appropriate

b) Major elements

(1) Acute stroke team (see above)

(2) Written care protocols (see above)

(3) Emergency medical services – close communication between the stroke center and EMS, not only with each suspected stroke patient, but also in general with information and education regarding early management of stroke

(4) Emergency department – close integration with EMS and stroke team, along with appropriate training and protocols for diagnosis and treatment of stroke

(5) Stroke unit – only for those stroke centers that will be admitting patients for ongoing care

(6) Neurosurgical services – should be available within 2 hours of recognizing such a need; this could involve transfer to another facility

(7) Neuroimaging – CT or MRI brain available within 25 minutes of original order and experienced interpretation within 20 minutes of completion (24 hours daily)

(8) Laboratory services – blood cell counts, chemistry, coagulation studies, electrocardiogram, and chest x-ray results available within 45 minutes of order (24 hours daily)

(9) Outcomes/quality improvement – development of database or registry of parameters can be compared to assess progress

(10) Educational programs – professional staff should have 8 hours of relevant continuing education yearly and there should be 2 annual public education programs

(11) Support of medical organization – administrative and personnel commitment to the program as well as the presence of a designated medical director

c) Certification

(1) By JCAHO

(2) Eligibility

- Operational stroke center for at least 3 months
- Submission of application fee

(3) Initial certification is one year with additional year contingent on additional documentation; then two year renewal

3. Comprehensive stroke centers

a) Capabilities

(1) Same as primary stroke center

(2) Ongoing inpatient care

(3) Specialized testing (e.g. angiography, transcranial doppler)

(4) Specialized procedures (e.g. carotid stenting; carotid endarterectomy)

(5) Rehabilitation

(6) Research

b) Major elements

(1) Personnel

- Vascular neurology
- Vascular neurosurgery
- Diagnostic neuroradiology
- Vascular surgery
- Interventional neuroradiology
- Rehabilitation physician
- Rehabilitation therapists
- Staff stroke nurse
- Radiology technologist

(2) Diagnostic capabilities

- MRI with diffusion
- MR angiography
- Digital cerebral angiography
- Carotid duplex ultrasound
- Stroke registry

c) Certification

(1) Not yet available

C. Between hospitals and including other agencies

1. Components of care

a) Primary prevention

b) Patient education

c) Emergency medical services

d) Acute stroke treatment

e) Subacute stroke treatment and secondary prevention

f) Rehabilitation

g) Quality assurance

2. Advantages

a) Ensuring the provision of evidence-based care to all patients with stroke

b) Providing appropriate coverage for those geographic areas that may be otherwise neurologically underserved

3. Linkages

a) Transport

(1) Hasten delivery of patient to capable facility

(2) Transfer of patients between facilities as necessary

(3) Ability to cross geopolitical boundaries

(4) Coordinated emergency response call centers and EMS agencies

b) Interhospital

(1) Each facility must recognize its own limitations

(2) Predetermined interhospital protocols and transfer agreements should be in place

(3) Availability of neurologic consultation in ER at least by telephone with neurologist or tertiary facility with equivalent expertise

(4) Availability of rehabilitation assessment by agreement with other specialty facilities

c) Radiology

(1) Teleradiology for rapid review of CT scans with qualified radiologists

XI. Recommendations

A. Pre-hospital

1. Patient education

a) What patients need to know

(1) Risk factors for stroke

(2) Symptoms of stroke

(3) Actions to take in the event of a suspected stroke

- Seek medical attention immediately
- Call 911

b) How to educate patients

(1) Primary physician

- Learn patient's habits
- Communicate these to the patient
- Provide printed information materials

(2) Hospitals

- Educational/informational programs
- Stroke support groups
- Screening sessions for risk factors

(3) Special interest groups (i.e. American Stroke Association, National Stroke Association)

- Educational programs
- Screening sessions
- Printed literature
- Educational grants

2. Emergency Medical System

a) Recognition

(1) Dispatch

- Should be able to recognize suspicious complaints as possible stroke symptoms

(i) Confusion

(ii) Weakness

(iii) Dizziness

(iv) Falling

- Should communicate possibility to stroke to emergency personnel in field

(2) On-site

- Cincinnati pre-hospital stroke scale (Appendix 1)

- Language
- Facial weakness
- Arm weakness (drift)

(3) Awareness of other conditions similar to stroke

- Seizure
- Hypoglycemia
- Hyperventilation

3. Management

a) On-site

(1) Check vital signs

(2) Intervene with any life-threatening conditions

(3) Consider oxygen administration if oxygen saturation is less than 93%

(4) Perform Cincinnati pre-hospital stroke scale

(5) Obtain history

- Type of onset: gradual vs. abrupt
- Onset while awake or asleep
- Duration of symptoms
- Nature of symptoms

b) Transport

(1) As soon as possible

(2) Start intravenous access (any IV fluids should be normal saline)

(3) Nothing by mouth

(4) Contact ER destination and notify nature of problem and estimated time of arrival

(5) Check blood sugar by finger stick

(6) Place on cardiac monitor

c) Transfer to ER care

(1) Provide history

- Time of onset

- Symptoms
- Findings of examination

(2) Provide medication list

B. Emergency Room

1. Contact with EMS

a) Time of symptom onset

b) Identify symptoms

c) Stability of patient

d) Medications

2. Triage

a) Recognize symptoms of walk-in patients

b) Determine time of onset of symptoms

3. Evaluation

a) Examination

(1) Neurologic

- Cincinnati pre-hospital stroke scale or NIH stroke scale

(2) Vital signs

(3) Cardiac

(4) Neck

b) Labs

(1) Finger stick blood sugar

(2) CBC

(3) Electrolytes, BUN, creatinine, and glucose

(4) Protime and PTT

c) Imaging

(1) CT brain

d) Cardiac

(1) Electrocardiogram

e) Neurology consultation

4. Treatment

a) Intravenous TPA

(1) Does patient meet criteria

- May treat hypertension

(i) Oral antihypertensive medication

(ii) Intravenous labetolol

(2) Neurologist should concur with treatment

(3) Patient should have two intravenous access slits

b) Aspirin

(1) If no TPA

(2) If no medical contraindication

- If aspirin allergy, use clopidogrel (Plavix) 75 mg

(3) If no hemorrhage on head CT

(4) If patient can safely swallow

- Consider rectal suppository if patient cannot swallow

c) Alternative therapies

(1) Consider when:

- Symptom onset longer than 3 hours earlier
- Documented occlusion of large vessel
- Basilar artery involvement

(2) Recommended by neurologist

(3) Performance

(4) By practitioner with expertise with the procedure

(5) At facility with expertise in and capabilities for the procedure and care of the patient, including potential complications afterward

5. Disposition

a) Admit to intensive care unit

(1) Received TPA

(2) Recent aspiration

(3) Persistent oxygen desaturation

(4) Cardiac dysrhythmia

(5) Evidence of concurrent MI

(6) Need for IV control of hypertension

b) Admit to general medical or neurologic floor

(1) No TPA

(2) Otherwise stable

C. In hospital

1. Evaluation

2. Dependent on clinical localization of event

a) Anterior circulation (i.e. carotid distribution)

(1) Carotid doppler

(2) Echocardiogram

(3) MRI with diffusion-weighted imaging

b) Posterior circulation

(1) MR angiography

(2) Echocardiogram

(3) MRI with diffusion-weighted imaging

c) Subcortical lacunar syndrome

(1) Carotid doppler

(2) MRI with diffusion-weighted imaging

3. Dependent on suspected etiology

a) Aortic disease

(1) Transesophageal echocardiogram

b) Coagulopathy

(1) Protein C&S

(2) Antithrombin III

(3) Leiden factor V

c) Inflammation

(1) Sedimentation rate

(2) Syphilis serology

(3) Serum protein electrophoresis

d) Immunologic

(1) Anticardiolipin antibody

(2) Lupus anticoagulant

(3) Antiphospholipid antibodies

e) Metabolic

(1) Serum homocysteine level

(2) Fasting blood sugar

(3) Lipid profile

4. Acute Management

a) Medical

(1) Post TPA

(2) Neurologic assessment every 15 minutes during infusion, every 30 minutes for the next 6 hours, and every hour until 24 hours after infusion

- Obtain emergent head CT if change in neurologic status, severe headache, or nausea/vomiting

(3) Monitor blood pressure every 15 minutes for the first two hours, every 30 minutes for the next 6 hours, and every hour until 24 hours after infusion

- If systolic blood pressure is between 180 and 230 mm Hg diastolic blood pressure is between 105 and 120 mm Hg, give labetolol 10 mg over 1-2 minutes and repeat or double the dose every 10 to 20 minutes up to 300 mg, check blood pressure every 15 minutes until stable (two consecutive readings)

- If systolic blood pressure is greater than 230 mm Hg or diastolic blood pressure is between 121 and 140 mm Hg, give labetolol as above, or 10 mg IV bolus followed by a continuous infusion at 2-8 mg/min if unsuccessful, start infusion of sodium nitroprusside at 0.5 mcg/kg/min and monitor blood pressure every 15 minutes during treatment

- If diastolic blood pressure is greater than 140 mm Hg, infuse sodium nitroprusside and monitor blood pressure every 15 minutes during treatment

(4) No anticoagulant or antiplatelet agents for the first 24 hours after TPA administration

(5) For first 24 hours after TPA administration, no:

- Nasogastric tubes

- Urinary catheters
- Intraarterial catheters

b) General supportive care

(1) Ventilation

- Oxygen saturation greater than 93%
- Use supplemental oxygen only if necessary to maintain this level
- Intubation
- Severely obtunded patients
- Clear inability to manage own secretions
- Persistent tachypnea despite supplemental oxygen

(2) Fever

- There is evidence that fever with acute ischemic stroke is associated with poorer neurologic outcomes
- Treat promptly with antipyretics, cooling blanket
- Look for source

(3) Cardiac rhythm

- Can be a complication of stroke or for stroke
- Cardiac monitoring for 48 hours

(4) Blood glucose

- No evidence that aggressive management of blood sugar improves outcomes after stroke
- Hyperglycemia may be a reflection of the severity of a stroke
- Hypoglycemia can mimic symptoms of stroke
- Monitor blood glucose as for any seriously ill patient and with respect to preexisting diabetes
- Treat blood sugars of less than 80 mg/dl or greater than 300 mg/dl

(5) Blood pressure

- Hypertension should be treated when
- Systolic blood pressure is greater than 220 mm Hg
- Diastolic blood pressure is greater than 120 mm Hg

- Hemorrhagic transformation of stroke
- Hypertensive encephalopathy
- Arterial dissection
- Acute renal failure
- Acute pulmonary edema
- Treatment of hypertension should be cautious and gradual over hours and not minutes
- Hypotension should be treated (e.g. mean arterial pressure below 100 mm Hg)
- IVF with normal saline
- Patient flat in bed
- Avoid pressure lowering medications
- Consider vasopressors in persistent cases

c) Complications

(1) Aspiration

- Prevention
- Bedside swallow evaluation with sips of water
- Speech therapy for video fluoroscopic swallow evaluation
- Diet appropriate to swallow function
- Proper positioning for meals
- Close monitoring during first two or three meals after stroke
- Bedside suction available
- Treatment
- Percutaneous gastric tube when evidence of aspiration
- Close monitoring for fever
- Speech therapy for rehabilitation of swallow

(2) Deep venous thrombosis

- Prevention
- Compression stockings in mobile patients
- Sequential compression devices

- Subcutaneous heparin or heparinoids in patients with severe paralysis
- Passive range of motion 2 to 3 times daily in paralyzed limbs (especially upper extremity)
- Treatment
- Coumadin when deep venous thrombosis is detected
- Inferior vena cava filter if Coumadin is contraindicated

(3) Pressure sores

- Prevention
- Especially susceptible if smoker, malnourished or have dry skin
- Frequent turning
- Alternating pressure mattresses
- Dietary consult to establish adequate protein level
- Treatment
- Skin care consultation
- Surgical consultation

(4) Infection

- Urinary tract
- Avoid indwelling catheters
- Acidify urine
- Anticholinergic agents when neurologic dysfunction
- Pneumonia
- Aspiration precautions
- Early mobilization
- Chest x-ray with any fever
- Prompt antibiotic therapy

(5) Depression

- Prevention
- 50% of stroke patients will develop depression
- Talk to patient and family

- Watch for signs: poor motivation, withdrawal, agitation, anorexia, insomnia
- Support groups
- Treatment
- Antidepressant medication (watch for sedation)
- Counseling
- Support groups

(6) Falls

- Prevention
- Identify patient as fall risk for staff
- Bed alarms
- Assistance with initial activity
- Implement falls prevention program
- Treatment
- Evaluate patient immediately after fall
- Radiologic evaluation of involved part of body

(7) Cerebral edema and increased intracranial pressure

- Prevention
- Nothing specifically known
- Close observation for signs of increased intracranial pressure (e.g. nausea/vomiting, headache, decreased consciousness, increased neurologic deficit)
- Treatment (in order of severity of problem)
- Avoid hyposmolar fluids
- Elevate head to 30%
- Diuretic (e.g. furosemide, mannitol)
- Ventriculostomy
- Craniectomy and decompression (predominately for posterior fossa strokes)

(8) Seizures

- Prevention
- Prophylactic use of antiepileptic medicine is <u>not</u> helpful

- Treatment
- Check EEG
- Antiepilepsy medicine only of EEG has epileption activity or there has been more than one seizure
- Choice of agent depends on other conditions and medications of the patient

(9) Hemorrhagic transformation

- Prevention
- Avoidance of unnecessary or inappropriate use of anticoagulant and antiplatelet medications (see above information)
- Treatment
- Prompt CT evaluation of neurologic decline
- Restrict anticoagulant and antiplatelet medications temporarily
- Check coagulation parameters
- Consider reversal of anticoagulation
- Consider administration of platelets or cryoprecipitate
- Consider surgical evacuation
- Decisions will depend on situation and patient's condition

d) Identification of risk factors

(1) Obtain additional history

- Past medical history of conditions that could increase the risk of stroke (e.g. hypertension, diabetes mellitus, atrial fibrillation, coronary artery disease and hypercholesterolemia)
- Identify habits (e.g. tobacco, alcohol/illicit drug, diet and exercise)
- Family history of stroke or coagulation disorders

(2) Evaluate blood pressure trends

(3) Check metabolic status

- Fasting glucose
- Fasting lipid profile
- Serum homocysteine level

e) Treatment of risk factors

(1) Hypertension

- Prehypertension: systolic blood pressure; 120-139 mm Hg diastolic blood pressure 80-89 mm Hg
- Blood pressure greater than 140/90 mm Hg
- Initiate medication with consideration of patient's overall condition

(2) Diabetes mellitus

- Maintain fasting blood sugar less than 120 mg/dl
- Maintain glycosylated hemoglobin less than 7%
- Monitor lipids annually
- Initiate lifestyle changes: diet exercise, and weight loss

(3) Hypercholesterolemia

- Maintain tryglycerides less than 150 mg/gl
- Maintain LDL less than 70 mg/dl (ideally)
- Intervention may require medication

(4) Tobacco

- Smoking cessation program

(5) Serum homocysteine level

- Folic acid, vitamins B12 and B6

f) Treatment of etiology

(1) Atrial fibrillation

- Start Coumadin since patient now has risk factors for stroke in addition to atrial fibrillation (brand-name Coumadin should be used due to potential variability with multiple available generic products)
- Other risks may preclude use of Coumadin (e.g. recurrent GI bleeding, recurrent falls)

(2) Carotid stenosis (symptomatic by definition since patient has had TIA)

- Stenosis less than 50%: antiplatelet agents
- Stenosis greater than 50% in men and 70% in women
- Consider carotid endarterectomy at institution with surgical risk of stroke and death of less than 3%

- Consider carotid artery stenting in patients with restenosis after prior carotid endarterectomy, poor cardiac status, prior neck irradiation, difficult surgical access or high anesthetic risk (procedure should be performed at facility designated as a comprehensive stroke center by interventionalists certified to perform this procedure)

(3) Intracranial vascular disease

- Antiplatelet agents
- Aspirin: if first event
- Aspirin/dipyridamole: if event occurred while patient on aspirin
- Ticlopidine: if event occurred while patient on aspirin/dipyridamole
- Clopidrogel: if patient also has documented coronary or peripheral vascular disease or is allergic to aspirin
- Angioplasty or stenting may be appropriate in specific research settings

(4) Coagulation disorders

- Coumadin is generally indicated
- Consult hematologist

5. Nursing

a) Patient care

(1) Check vital signs and neurologic status for deviations from baseline

- Immediately inform physician of any negative deviations
- Closer monitoring of blood pressure as patient's mobility increases
- Check orthostatic blood pressure and heart rate when patient is initially able to get out of bed
- Evaluate blood pressure medications in order to maintain requested limits on vital signs
- Monitor oxygen saturation for at least first 24 hours after event

(2) Assess patient's swallow

- Initially sips of water, then progressively more solid foods
- If swallow impaired, nothing by mouth and consult speech therapy for more detailed evaluation
- If swallow functional, assure diet appropriate for patient overall needs (e.g. low sodium) and consult dietician as necessary)

(3) Administer medication

- Maintain IV including fluids as ordered
- Anticoagulation: obtain and monitor coagulation levels to maintain within prescribed parameters

(4) Post-TPA care

- Monitor for bleeding at puncture sites
- Increased frequency of vital signs and neurologic assessments per protocol
- Ensure avoidance of anticoagulants and antiplatelet agents during the first 24 hours after infusion
- No invasive tubes or catheters
- Monitor patient for complications

(i) Aspiration – upright during meals, supervision as needed

(ii) Deep venous thrombosis – compression stockings, sequential compression devices

(iii) Pressure sores – move patient frequently, daily check of skin

(iv) Urinary tract infection – avoid catheters

(v) Depression

(vi) Falls – bed alarms

b) Education

(1) Assess patient and family for baseline knowledge

- Risk factors
- Diagnostic tests
- Medications
- Surgical therapies

(2) Facilitate and educate the patient and family according to assessment of knowledge deficit appropriate to their educational level and learning style

- TPA
- Risk factors
- Diagnostic tests

- Medications

(3) Educational materials may include:

- Printed materials
- Video recordings
- Websites
- Support groups (e.g. national organizations and local groups)

D.Rehabilitation

6. Transfer from acute care hospital to rehabilitation facility

7. Overall medical condition should be stable

8. All acute medical evaluation should be complete (e.g. CT, MRI, vascular imaging, etc.)

9. Evaluation of patient's rehabilitation potential for appropriate rehabilitation service transfer

10. Acute Care Hospital

11. Initiate therapy evaluation and treatment within 24-48 hours or after medical stabilization in all patients with stroke

12. Begin evaluation of self-care ability – referral to occupational therapy

13. Bedside swallowing evaluation – referral to speech therapy

14. Maintain joint mobility/promote independent movement – referral to physical therapy

15. Cognitive changes – referral to neuropsychology

16. Prevent further medical/neurologic complication through appropriate medication and fluid administration; adequate positioning and safety precautions; monitoring of skin condition, elimination and nutrition

17. Acute rehabilitation unit in a hospital or free-standing rehabilitation hospital

18. Medically stable

19. Need 24 hour rehabilitation nursing supervision and physician care

20. Physical disability or cognitive impairment – able to do 25-50% of the work

21. Requires more than one therapy and can tolerate therapy for minimum of 3 hours per day 5-6 days per week

22. Potential for functional improvement and return to community

23. Long term acute care hospital

24. Complex medical needs

25. Need 24 hour nursing supervision and physician care

26. Physical disability or cognitive impairment – dependent

27. Unable to participate in therapy or very low endurance – 1-2 hours per day

28. Expected length of stay 25 days

29. Subacute rehabilitation unit either hospital based or in a skilled facility

30. Medically stable

31. Need 24 hour nursing supervision

32. Physical disability or cognitive impairment – dependent or able to do less than or equal to 25% of the work

33. Low endurance for therapy – 1-2 hours per day

34. Outpatient therapy

35. Medically stable

36. Not needing 24 hour nursing supervision or physician care

37. Needs 1-2 therapies 2-3 days per week

38. Day treatment – requires groups for socialization and cognition in addition to 2-3 therapies for 3-5 days/week to address physical or cognitive impairments

39. Physical disability or cognitive impairment – able to do 75% of the task or requires supervision

40. Excellent family/social support

41. Home based nursing care and therapy

42. Medically stable

43. Not needing 24 hour nursing supervision or physician care

44. Homebound

45. Adequate social support or be able to be alone in home environment

46. Physical disability or cognitive impairment – able to do 50-75% of the work

47. Parameters dependent on patient's deficits and needs

48. Length of stay in rehabilitation unit

49. Daily duration and schedule of therapies

50. Type of therapies

51. CARF

52. Not necessarily practical for every rehabilitation setting

53. Rehabilitation settings with stroke as one of their top diagnoses should strongly consider CARF accreditation as a stroke specialty program.

E.Hospital Systems

54. Within the hospital

55. Emergency room

a) All personnel should be trained in recognition of stroke

(1)Risk factors

(2)Symptoms

(3)Signs (at least Cincinnati pre-hospital stroke scale)

b) Protocol in place for management of stroke patient

(4)Acute management

(a)TPA protocols, including CT and laboratory availability

(5)To nearest hospital for evaluation and possible transfer to primary stroke center if

(a)The patient is in cardiac arrest

(b)The patient has unmanageable airway

(c)The patient has other medical conditions that warrant transport to the closest appropriate hospital ER as per protocols

(d)The total pre-hospital time is greater than 2 hours

(e)An online physician directs

(6)Hospital or corporate affiliations as well as local and state boundaries should not interfere with safe and efficient transport

56. Hospitals

a) Develop network to facilitate transfer of patients for:

(7)TPA administration

(8)Inpatient management (e.g. ICU, neurosurgery, special testing)

(9)Advanced procedures (e.g. stenting, mechanical thrombectomy)

(10)Rehabilitation

b) May involve multiple referral patterns, but specific agreements preferred for:

(11)Standardized protocols

(a)Treatment

(b)Transfer

(12)Consistent communication pathways

(13)Facilitation of educational processes for staff

(14)Hastening transfers

57. Specialty organizations (e.g. American Stroke Association, National Stroke Association

a) Should be involved with any hospital treating stroke

b) Should participate with:

(15)Assisting in stroke center certification

(16)Providing access to quality improvement tools

(17)Assisting with educational efforts (i.e. patients and staff)

(18)Increasing public awareness

(19)Advocacy

These guidelines are intended to be a basis from which patient care may be individualized for each patient's situation. Diagnostic and therapeutic procedures and medical treatments are continuously being evaluated and improved. Experience varies with different procedures; therefore, some procedures require more stringent limitations to their utilization than others based on experience and application. The practice of medicine is continuously changing. These guidelines are particularly pertinent for the point in time during which they have been published. Advancement in medical techniques will necessarily update the propriety of these recommendations.

Suggested reading:

Adams, H.P., et.al. "Guidelines for the Early Management of Patients With Ischemic Stroke." Stroke. 34: 1056-1083. (2003).

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Albers, G.W., et.al. "Antithrombotic and Thrombolytic Therapy for Ischemic Stroke." Chest. 126: 4835-5125. (2004)

Alberts, M.J., et.al. "Recommendations for the Establishment of Primary Stroke Centers." Journal of the American Medical Association. 283: 3102-3109. (2000).

Alberts, M.J., et.al. "Recommendations for Comprehensive Stroke Centers." Stroke. 36: 1597-1616.(2005).

Fulgham, J.R., et.al. "Management of Acute Ischemic Stroke." Mayo Clinic Proceedings. 79: 1459-1469. (2004).

Schwamm, L.H., et.al. "Recommendations for the Establishment of Stroke Systems of Care." Stroke. 36: 690-703. (2005).

APPENDIX 1

Cincinnati Pre-hospital Stroke Scale

1. Facial droop – asymmetry of smile
2. Arm drift – arms directly extended in front of chest with eyes closed
3. Speech problem – slurring or unintelligible speech

APPENDIX 2

National Institutes of Health Stroke Scale

1. (a) Level of consciousness:	Alert	( ) 0
	Drowsy	( ) 1
	Stuporous	( ) 2
	Coma	( ) 3
(b) Level of consciousness questions	Answers both correctly	( ) 0
	Answers one correctly	( ) 1
	Incorrect	( ) 2
(c) Level of consciousness commands	Obeys both correctly	( ) 0
	Obeys one correctly	( ) 1
	Incorrect	( ) 2
2. Best gaze:	Normal	( ) 0
	Partial gaze palsy	( ) 1
	Forced deviation	( ) 2
3. Best visual	No visual loss	( ) 0
	Partial hemianopsia	( ) 1
	Complete hemianopsia	( ) 2
4. Facial palsy	Normal	( ) 0
	Minor	( ) 1
	Partial	( ) 2
	Complete	( ) 3
5. Best motor right arm	No drift	( ) 0
	Drift	( ) 1
	Cannot resist gravity	( ) 2
	No effort against gravity	( ) 3
	No movement	( ) 4
6. Best motor left arm	No drift	( ) 0
	Drift	( ) 1
	Cannot resist gravity	( ) 2
	No effort against gravity	( ) 3
	No movement	( ) 4

7. Best motor right leg	No drift	( ) 0
	Drift	( ) 1
	Cannot resist gravity	( ) 2
	No effort against gravity	( ) 3
	No movement	( ) 4
8. Best motor left leg	No drift	( ) 0
	Drift	( ) 1
	Cannot resist gravity	( ) 2
	No effort against gravity	( ) 3
	No movement	( ) 4
9. Limb ataxia	Absent	( ) 0
	Present in either upper or lower	( ) 1
	Present in both upper and lower	( ) 2
10. Sensory	Normal	( ) 0
	Partial loss	( ) 1
	Dense loss	( ) 2
11. Neglect	No neglect	( ) 0
	Partial neglect	( ) 1
	Complete neglect	( ) 2
12. Dysarthria	Normal articulation	( ) 0
	Mild to moderate dysarthria	( ) 1
	Near unintelligible or worse	( ) 2
13. Best language	No aphasia	( ) 0
	Mild to moderate aphasia	( ) 1
	Severe aphasia	( ) 2
	Mute	( ) 3

APPENDIX 3

Stroke Protocols/Pathways Internet Examples

The Brain Attack Coalition: Pathways
http://stroke-site.org/pathways/pathways.htm.

Thomas Jefferson University Hospital: Acute Ischemic Stroke Critical Pathway Cards
http://stroke-site.org/pathways/tjuhcard_part1.pdf
http://stroke-site.org/pathways/tjuhcard_part2.pdf

North Carolina Baptist Hospitals: Ischemic Stroke Care Map
http://www.stroke-site.org/pathways/nc_caremap.pdf

Deaconess Hospital Protocols (JCAHO Designated Primary Stroke Center)

- Patient Care Path: ISCHEMIC STROKE – Hospital Stay: 4 days
- CVA Care Path for Ischemic Strokes (TPA)
- NIH Stroke Scale – TPA
- NIH Stroke Scale – Non-TPA

(Patient Label)

NIH STROKE SCALE - NON-TPA

DEACONESS HOSPITAL
Evansville, Indiana 47747

1a. LEVEL OF CONSCIOUSNESS
0 = Alert, keenly responsive
1 = Not alert, arouseable by minor stimulation to obey, answer, or respond
2 = Not alert; requires repeated stimulation, obtunded and requires painful stimulation
3 = Unresponsive

1b. LOC QUESTIONS (year & age)
0 = Answers both correctly
1 = Answers one correctly
2 = Answers neither correctly

1c. LOC COMMANDS (open/close eyes/fist)
0 = Performs both correctly
1 = Performs one correctly
2 = Performs neither correctly

2. LATERAL GAZE PARESIS
0 = None
1 = Partial paresis one or both eyes
2 = Total or forced gaze paresis, not overcome by oculocephalic maneuver

3. VISUAL FIELD LOSS
0 = No visual field loss
1 = Partial hemianopsia
2 = Complete hemianopsia
3 = Bilateral hemianopsia (blind)

4. FACIAL PALSY
0 = Normal symmetrical movement
1 = Minor paralysis
2 = Partial paralysis (total or near total paralysis of lower face) paralysis
3 = Complete paralysis (absence of facial movement in upper and lower face, one or both sides)

5a. LEFT ARM—Motor Arm (10-second hold)
0 = No drift
1 = Drift, does not touch bed
2 = Drift, effort yet touches bed
3 = No effort, limb falls
4 = No movement
9 = Not testable (amputation, joint fusion)
Explain: _____

5b. RIGHT ARM—Motor Arm (10-second hold)
0 = No drift
1 = Drift, does not touch bed
2 = Drift, effort yet touches bed
3 = No effort, limb falls
4 = No movement
9 = Not testable (amputation, joint fusion)
Explain: _____

6a. LEFT LEG—Motor leg (5-second hold)
0 = No drift
1 = Drift, does not touch bed
2 = Drift, effort yet touches bed
3 = No effort, limb falls
4 = No movement
9 = Not testable (amputation, joint fusion)
Explain: _____

6b. RIGHT LEG—Motor leg (5-second hold)
0 = No drift
1 = Drift; does not touch bed
2 = Drift; effort yet touches bed
3 = No effort, limb falls
4 = No movement
9 = Not testable (amputation, joint fusion)
Explain: _____

7. LIMB ATAXIA (finger /nose/heel/shin)
0 = Absent
1 = Present one limb
2 = Present in two limbs
9 = Not testable
If present, ataxia in:
Right arm— yes / no
Left arm— yes / no
Right leg— yes / no
Left leg— yes / no

8. SENSOR LOSS (pinprick arms/legs/face)
0 = No sensory loss
1 = Mild, aware yet dulled
2 = Severe to total loss, comatose

9. LANGUAGE APHASIA (description/ naming/reading)
0 = No aphasia; normal
1 = Mild, loss fluency, anomia, yet understandable
2 = Severe, fragmentary, not understandable
3 = Mute, global aphasia

10. DYSARTHRIA (speech clarity)
0 = Normal
1 = Slurring, intelligible
2 = Severe slurring, unintelligible, or mute
9 = Intubated or physical barrier
Explain: _____

11. EXTINCTION AND INATTENTION (visual/tactile/auditory/spatial/ personal)
0 = No abnormality
1 = Abnormal in one modality
2 = Profound hemi-inattention in multiple modalities

TOTAL
(EXCLUDING ALL SCORES OF 9):

_____

Date: _____ Time: _____ R. N. SIGNATURE: _____

Date: _____ Time: _____ PHYSICIAN'S SIGNATURE: _____

(PATIENT LABEL)	**TPA INCLUSION/EXCLUSION CRITERIA** DEACONESS HOSPITAL Evansville, Indiana 47747

	INCLUSION CRITERIA – All must be answered <u>YES to treat</u> with TPA.	**YES**	**No**
1.	Age 18 or older.	☐	☐
2.	Clinical diagnosis of ischemic stroke causing measurable neurologic deficit (defined as impairment of language, motor function, cognition and/or gaze, vision or neglect). Ischemic stroke is defined as an event characterized by the sudden onset of an acute focal neurologic deficit presumed to be due to cerebral ischemia.	☐	☐
3.	Time of onset well established < 180 minutes before treatment would begin.	☐	☐
4.	CT excludes hemorrhage and no Radiographic evidence of recent stroke, i.e. sulcal effacement or edema.	☐	☐
5.	NIH Stroke Scale (NIHSS) > 3 and < 22	☐	☐

	CONTRAINDICATIONS - All must be answered <u>NO to treat</u> with TPA	**Yes**	**NO**
1.	Current use of oral anticoagulants with a prothrombin time > 15 seconds & INR > 1.7	☐	☐
2.	Use of heparin or low molecular weight heparin in the previous 48 hours <u>and</u> a prolonged partial thromboplastin time.	☐	☐
3.	A platelet count < 100,000.	☐	☐
4.	Another stroke or a serious head injury in the previous 3 months.	☐	☐
5.	Prior intracranial hemorrhage	☐	☐
6.	Major surgery or trauma within the preceding 14 days.	☐	☐
7.	Persistent pretreatment SBP > 185 mmHg or DBP > 110 mmHg.	☐	☐
8.	Rapidly improving neurological signs <u>or</u> isolated, mild neurological deficits, such as ataxia alone, sensory loss alone, dysarthria alone or minimal weakness.	☐	☐
9.	Blood glucose < 50 mg. or > 400mg.	☐	☐
10.	Seizure at the onset of stroke.	☐	☐
11.	Gastrointestinal or urinary bleeding within preceding 21 days.	☐	☐
12.	Post myocardial infarction pericarditis.	☐	☐
13.	Known intracranial neoplasm, AV malformation, or aneurysm.	☐	☐
14.	Woman known to be or suspected to be pregnant.	☐	☐
15.	Clinical presentation suggestive of subarachnoid hemorrhage, even with a normal CT.	☐	☐
16.	Arterial puncture at a noncompressible site or lumbar puncture within 1 week.	☐	☐

Date: _____ Time: _____ PHYSICIAN'S SIGNATURE: _____

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747 **ISCHEMIC STROKE ORDERS (NON-TPA) Day 1** **Page 1 of 5**

Date	Hour		PHYSICIAN'S ORDERS
			(Orders with asterisks or check box options must be clarified by M.D. before ordered)
		*1.	**Admit to Dr. _____** **Inpatient bed status: Admit to Neuro Care Center (NCC)** **If needed, may admit to Unit 3900** **All other admission locations to be cleared with Attending Physician**
		*2.	Physician Consult:
		*3.	**Assessment** Document NIH Stroke Scale on admission and q 8 hours Measure NIH Stroke Scale items 1,5, & 6 q 2 hrs x _____hours, then q 4 hours Assess for pain on admission and q 8 hours using VAS scale
		*4.	**Blood pressure management** • If BP above target parameters below, monitor and document BP q15 minutes. Verify BP reading with manual cuff. Avoid hypotension. If BP (systolic or diastolic) is out of target parameters for 2 readings 5-10 minutes apart, **notify M.D.** • Blood pressure parameters: Contact MD if SBP >190mm Hg and/or DBP >110mm Hg. If patient is fully anticoagulated receiving treatment doses of anticoagulants (not prophylactic doses), then contact MD if SBP > 160mmHg and/or DBP > 100mmHg. If patient has severe cardiac disease (i.e. unstable angina or symptomatic CHF), consult cardiologist or attending physician for target blood pressure parameters. Other: _____
		*****5.	**Intravenous Therapy** ☐ Normal Saline _____ml/hr ☐ Normal Saline with 20mEq KCL _____ml/hr
		*6.	**Labs** (Check desired labs) ☐ Stroke Panel (CMP, CBC, INR/PT, APTT) ☐ Cardiac Enzymes ☐ Urinalysis and culture ☐ FTA ☐ IEP ☐ Beta HCG pregnancy test, if famale of child bearing age ☐ WESR Other: _____ ☐ Fasting lipid profile
		*****7.	**Diagnostics** Stat Non-contrast CT of head, CXR and 12 lead EKG , if not already done Must check if desire additional tests: ☐ MRI head ☐ Cardiac ECHO to be read by_____ ☐ Carotid doppler ☐ TEE to be read by _____ ☐ MRA head ☐ Intracerebral ☐ Extracerebral
		*8.	**Medications** (Check all desired medications) ☐ EC ASA 325mg. p.o. q day. If unable to take p.o., may give ASA 300mg. rectally q day. If ASA intolerant, may give Plavix 75mg. q day ☐ Lovenox 40mg. subq q day ☐ Tylenol 650mg. p.o. or rectally every 6 hours prn pain or fever ☐ Dulcolax 10mg. rectally b.i.d. p.r.n. constipation, give if no bowel movement documented in 2 days ☐ Promethazine 12.5mg. IV q 4 hours p.r.n. nausea Other medications as noted on separate order sheet
		9.	Initiate Ischemic Stroke Pathway
		10.	Weight on admission and daily

	PHYSICIAN'S ORDERS

(PATIENT LABEL)	DEACONESS HOSPITAL Evansville, Indiana 47747 **ISCHEMIC STROKE ORDERS (NON-TPA)** **Day 1 Continued** **Page 2 of 5**

Date	Hour		PHYSICIAN'S ORDERS
		11.	**Diet** NPO until dysphagia screen completed by RN. May advance diet as tolerated, if dysphagia screen is normal. If screen is abnormal, consult Speech Therapist for evaluation and advancement of diet orders. Modified Barium Swallow, if recommended by Speech Therapist. Notify M.D. for further diet orders if NPO >48 hrs, if Speech Therapist not available. Mouth care after meals and before bedtime.
		12.	**Activity** Bedrest. Fall precautions ROM by RN at least q 8 hours. Turning schedule posted above the patient's bed No lifting or pulling of shoulder on affected side No phlebotomy or IV on the affected side, if possible
		13.	**Monitoring** Remote Telemetry. Vital signs q 2 hours. Contact M.D. if pulse >120 or <50, respirations >24 or <12 per minute.
		14.	Elevate head of bed 20-30 degrees
		15.	Old chart to floor
		16.	**Oxygenation** O2 at 2 liters per/min. nasal cannula. May increase up to 4 liters/min to maintain sats >92%. Contact M.D. for further orders if >4 liters/min required
		17.	**Elimination:** Foley catheter as needed, measure intake and output
		18.	**Consults** Case Management Services for discharge planning (Rehab, SNF, Home Care or equipment needs) Physical Therapy to evaluate and treat Occupational Therapy to evaluate and treat Speech Therapy to evaluate and treat
		19.	**Glycemic Control** Measure blood glucose levels a.c. and h.s. Initiate Humulin R Standard Insulin Sliding Scale-Standard Dose orders May discontinue checks if no Insulin or D50W has been administered for 24 hours
		20.	**Education** Patient-Family Teaching Guidelines for Stroke provided to patient/family and documented by the admitting RN Information on new medications provided by RN
		21.	Pneumatic compression stockings and TED hose, if patient is not receiving Lovenox or Heparin
		22.	Proceed with Day 2, 3, 4 unless otherwise specified

PHYSICIAN'S SIGNATURE: _____

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747 **ISCHEMIC STROKE ORDERS (NON-TPA)** **Day 2** **Page 3 of 5**

Date	Hour		PHYSICIAN'S ORDERS
		1.	Vital signs q 4 hours if they have been stable
		2.	Document NIH Stroke Scale q 8 hours
		3.	O2 at 2 liters/min. per nasal canula to keep sats >92%
		4.	Foley Catheter can be removed if patient can safely be assisted to the bathroom or bedside commode.
		5.	IV fluids to be discontinued if patient is taking adequate p.o. diet > or equal to 50%
		6.	**Labs** CBC and BMP INR/PT (if on Coumadin)
		7.	Discontinue blood sugar checks if readings have been normal (desired range 70-150)
		8.	May change medicines to p.o. if patient has passed speech evaluation
		9.	**Activity** Out of bed, with assistance, in chair b.i.d.
		10.	**Medications:**

PHYSICIAN'S SIGNATURE: _____

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747
	ISCHEMIC STROKE ORDERS (NON-TPA) **Day 3** **Page 4 of 5**

Date	Hour		PHYSICIAN'S ORDERS
		1.	Vital signs q 8 hours if they have been stable
		2.	Document NIH Stroke Scale every day
		3.	Respiratory therapist to wean O2. Keep sats >92%
		4.	**Labs** CBC and BMP INR/PT (if on Coumadin)
		5.	Diet advanced as prescribed
		6.	**Activity** Out of bed with assistance t.i.d.
		7.	May change medicines to p.o. if patient has passed speech evaluation
		8.	**If on Coumadin**, Pharmacist to complete Coumadin education prior to discharge **Check desired box:** ☐ Patient to be followed for anticoagulation management post discharge by primary care physician ☐ Dr. _____to manage patient's anticoagulation post discharge ☐ Deaconess Anticoagulation Clinic to manage patient's anticoagulation post discharge. Goal INR_____ for_____duration. Notify Deaconess Anticoagulation Clinic at 450-3990 and fax referral to 450-3591
		9.	**Medications:**

PHYSICIAN'S SIGNATURE: _____

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747 **ISCHEMIC STROKE ORDERS (NON-TPA)** **Day 4** **Page 5 of 5**

Date	Hour		PHYSICIAN'S ORDERS
		1.	Vital signs q 8 hours, if they have been stable
		2.	Document NIH Stroke Scale prior to discharge NIH Stroke Scale Score_____.
		3.	Social Services to arrange transportation
		4.	Aftercare support system is identified by Case Manager or Social Worker
		5.	RN, Occupational Therapist, Physical Therapist and Speech Therapist to complete transfer forms
		6.	Pain or discomfort managed by oral medications, if needed
		7.	Discharge instructions completed by RN RN to verify that all stroke education materials and stroke medication information has been provided. Patient and family to be provided information pertaining to communication and cognitive deficits.
		8.	**Activity** Out of bed with assistance at least t.i.d. Patient and family demonstrate walking or ADL aids
		9.	Discharge medication prescriptions written and provided to patient or family, if needed
		10.	Discharge to home or transfer to outside facility
		11.	Follow up appointment with Dr. _____ in _____weeks.

PHYSICIAN'S SIGNATURE: _____

Deaconess Hospital Evansville, IN

Patient Care Path: ISCHEMIC STROKE - Hospital Stay: 4 days

This Patient Care Path is a measuring tool for outcome evaluation. It does not reflect the standard of care owed by a professional health care provider to a patient, is not a warranty of results, and allows for deviations both to adapt to patient needs and to allow for variations in resources and the professional judgments of health care

	Emergency Room	Day 1
Consults	• A doctor who specializes in strokes (CVA) may be called to discuss your care • Your family doctor will be notified	• Your family doctor will see you along with other doctors (specialists) if ordered Physical therapy, occupational therapy, • speech therapy will probably start seeing you today
Tests & Blood Work & Other	• You will have a CT scan of your head done, along with an EKG of your heart, and blood tests	• Blood work and x-rays may be done today
Medicine	• You may be given medicine for your blood pressure if needed. • You may be given medicine to get rid of a clot if needed.	• You will be given medicine as ordered by your doctor
Diet	• Your diet will be ordered by your doctor after your ability to swallow has been evaluated	• Your diet will be ordered by your doctor
Activity	• Bedrest	• Bedrest
Teaching Needs	• You may be asked to sign a consent form before getting special medicine to get rid of a clot if needed	• A Case Manager or Social Worker will talk with you to discuss discharge needs

Patient Care Path: ISCHEMIC STROKE - Hospital Stay: 4 days

This Patient Care Path is a measuring tool for outcome evaluation. It does not reflect the standard of care owed by a professional health care provider to a patient, is not a warranty of results, and allows for deviations both to adapt to patient needs and to allow for variations in resources and the professional judgments of health care

	DAY 2	Day 3	Day 4
Consults	• Your family doctor will see you along with other doctors • (specialists) if ordered Physical therapy, occupational therapy, and speech therapy will see you today	• Your family doctor will see you along with other doctors • (specialists) if ordered Physical therapy, occupational therapy, and speech therapy will see you today	• Your family doctor will see you along with other doctors (specialists) if ordered • Physical therapy, occupational therapy, and speech therapy will see you today
Tests & Blood Work & Other	• You may have another CT scan of your head today	• Blood may be drawn as ordered by your doctor	• Blood may be drawn as ordered by your doctor
Medicine	• You will be given medicine as ordered by your doctor	• You will be given medicine as ordered by your doctor	• You will be given medicine as ordered by your doctor
Diet	• Your diet will be ordered by your doctor	• Your diet will be ordered by your doctor	• Your diet will be ordered by your doctor
Activity	• You will have physical therapy as ordered by your doctor	• Physical therapy will continue working with you,with exercises and walking	• Physical therapy will continue working with you,with exercises and walking
Teaching Needs	• Physical therapy will instruct you on medical equipment needed at • discharge Social Worker will continue to discuss discharge needs and arrange nursing home transfer and/or Rehab transfer if appropriate.	• Social Worker will continue to discuss discharge needs and arrange nursing home transfer and/or Rehab transfer if appropriate	• You may go home today • You will be given discharge instructions and follow up appointments

(Patient Label)

NIH STROKE SCALE - TPA

DEACONESS HOSPITAL
Evansville, Indiana 47747

1a. LEVEL OF CONSCIOUSNESS
0 = Alert, keenly responsive
1 = Not alert, arouseable by minor stimulati on to obey, answer, or respond
2 = Not alert; requires repeated stimulation, obtu nded and requires painful stimulation
3 = Unresponsive

1b. LOC Q UESTIONS (year & age)
0 = Answers bot h correctly
1 = Answers one correctly
2 = Answers neither correctly

1c. LOC C OMMANDS (open/close eyes/fist)
0 = Performs both correctly
1 = Performs one correctly
2 = Performs neither correctly

2. LATERAL G AZE P ARESIS
0 = None
1 = Partial paresis one or both eyes
2 = Total or forced gaze paresis, not overcome by oculocephalic maneuver

3. VISUAL F IELD L OSS
0 = No visual field loss
1 = Partial hemianopsia
2 = Complete hemianopsia
3 = Bilateral hemianopsia (blind)

4. F ACIAL P ALSY
0 = Normal symmetrical movement
1 = Minor paralysis
2 = Partial paralysis (total or near total paralysis of lower face) paralysis
3 = Complete paralysis (absence of facial movement in upper and lower face, one or both sides)

5a. LEFT ARM—Motor Arm (10 -second hold)
0 = No drift
1 = Drift, does not touch bed
2 = Drift, effort yet touches bed
3 = No effort, limb falls
4 = No movement
9 = Not testable (amputation, joint fus ion)
Explain: _____

5b. RIGHT ARM—Motor Arm (10 -second hold)
0 = No drift
1 = Dri ft, does not touch bed
2 = Drift, effort yet touches bed
3 = No effort, limb falls
4 = No movement
9 = N ot testable (amputation, joint fusion)
Explain: _____

6a. LEFT LEG—Motor leg (5 -second hold)
0 = No drift
1 = Drift, does not touch bed
2 = Drift, effort yet touches bed
3 = No effort , limb falls
4 = No movement
9 = Not testable (amputation, joint fusion)
Explain: _____ _____

6b. RIGHT LEG—Motor leg (5 -second hold)
0 = No drift
1 = Drift; does not touch bed
2 = Drift; effort yet touches bed
3 = No effort, limb falls
4 = No movement
9 = Not testable (amputation, joi nt fusion)
Explain: _____

7. LIMB A TAXIA (finger /nose/heel/shin)
0 = Absent
1 = Present one limb
2 = Present in two limbs
9 = Not testable
If present, ataxia in:
Right arm — yes / no
Left arm — yes / no
Right leg — yes / no
Left leg — yes / no

8. SENSOR L OSS (pinprick arms/legs/face)
0 = No sensory loss
1 = Mild, aware yet dul led
2 = Severe to total loss, comatose

9. LANGUAGE A PHASIA (description/ naming/reading)
0 = No aphasia; normal
1 = Mild, loss fluency, anomia, yet understandable
2 = Severe, fragmentary, not understandable
3 = Mute, global aphasia

10. D YSARTHRIA (speech clarity)
0 = Normal
1 = Slurring, i ntelligible
2 = Severe slurring, unintelligible, or mute
9 = Intubated or physical barrier
Explain: _____

11. EXTINCTION AND INATTENTION (visual/tactile/auditory/spatial/ personal)
0 = No ab normality
1 = Abnormal in one modality
2 = Profound hemi -inattention in multiple modalities

TOTAL
(EXCLUDING ALL SCORES OF 9):

_____ _

Date: _____ Time: _____ R. N. SIGNATURE: _____

Date: _____ Time: _____ PHYSICIAN'S SIGNATURE: _____

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747 **TPA STROKE ORDERS** **Page 1of 4**

Date	Hour		**PHYSICIAN'S ORDERS**
		1.	**Inclusion criteria for TPA: All must be answered Yes to treat with tPA** ☐ **YES** ☐ **NO** ●Age 18 or older ●Clinical diagnosis of ischemic stroke causing measurable neurologic deficit (defined as impairment of language, motor function, cognition, and/or gaze, vision or neglect) ●Time of onset well established < 180 minutes before treatment would begin ●CT excludes hemorrhage and no radiographic evidence of recent stroke, i.e. sulcal effacement or edema ●NIH Stroke Scale (NIHSS) Score > 3 and < 22
		2.	**Contraindications for TPA. All must be answered NO to treat with tPA** ☐ **YES** ☐ **NO** ●Current use of oral anticoagulants with a prothrombin time > 15 seconds and INR > 1.7 ●Use of heparin or low molecular weight heparin in the previous 48 hours and a prolonged APTT ●a platelet count <100,000 ●another stroke or a serious injury in the previous 3 months ●prior intracranial hemorrhage ●major surgery or trauma within the preceding 14 days ●persistent pretreatment SBP >185 mmHg or DBP >110 mmHg ●rapidly improving neurological signs or isolated, mild neurological deficits, such as ataxia alone, sensory loss alone, dysarthria alone or minimal weakness ●blood glucose <50 mg/dl or >400 mg/dl ●seizure at the onset of stroke ●gastrointestinal or urinary bleeding within preceding 21 days ●post myocardial infarction pericarditis ●known intracranial neoplasm, AV malformation, or aneurysm ●woman known to be or suspected to be pregnant ●clinical presentation suggestive of subarachnoid hemorrhage, even with a normal CT ●arterial puncture at a noncompressible site or lumbar puncture within one week.
		3.	Obtain informed consent for Treatment of Stroke with Intravenous Clot-Dissolving Drug
		4.	**DO NOT ADMINISTER HEPARIN, WARFARIN OR ASPIRIN FOR 24 HOURS.** **CONSULT NEUROLOGIST FOR ORDERS AFTER 24 HOURS.**
		5.	**Administer Thrombolytic (TPA)** Assure time of symptom onset to arrival and NIHSS has been recorded. Obtain weight, verify orders & infusion calculations of thrombolytic therapy (TPA) prior to delivery. **Choose the smallest of the following two total stroke treatment doses:** A. Maximum total dose of 90mg., if weight greater than or equal to 100 Kg. B. Patient weight in kilograms _____ x 0.9 mg/kg = _____mg. Total calculated stroke dose = _____mg prepared as a 1:1 dilution. 10% of total dose as bolus (Total dose _____ x 0.1 = _____mg.) Bolus dose_____mg. Continuous infusion dose_____ mg. **Give tissue plaminogen activator (tPA) _____mg. IV over one minute as a 10% bolus followed by _____ mg. IV by continuous infusion over 60 minutes for a total dose of _____ mg.** When thrombolytic is in the IV tubing drip chamber, add 20 ml of normal saline to infusion bottle and continue at last hour infusion rate to ensure complete administration of thrombolytic dose.
		6.	• When thrombolytic started, record pulse, respirations, B/P, and neuro checks (NIHSS items 1,5 & 6): q 15 minutes x 2 hours THEN q 30 minutes x 4 hours THEN q 60 minutes x 24 hours. • Glascow Coma Scale q1hr. x 24 hours • Complete NIHSS q 8 hours x 24 hours. A **decline** in Neurological status of 2 points in the total abbreviated NIHSS indicates the need for a **complete** NIHSS reassessment.
		7.	Maintain SBP <185mmHg and DBP <110mmHg. • If SBP > 185 or DBP > 110: Verify with manual cuff pressure. • If SBP > 185 or DBP > 110 for 2 or more readings, 5-10 min. apart: Give Labetalol 20 mg. IV over 1-2 minutes. May repeat 20-40 mg. q 10 min. up to a total dose of 300 mg.
		8.	Initiate bleeding and seizure precautions.
		9.	Notify neurologist for evidence of untoward bleeding, neurologic deterioration, or vital signs causing hemodynamic compromise: • Systolic BP > 185 or < 110. Diastolic BP > 110 or Diastolic BP < 50. • Heart Rate < 50 with symptoms. Respiration rate >24 < 12
		10.	Initiate Post tPA Ischemic Stroke Orders

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747 **POST TPA ISCHEMIC STROKE ORDERS – Day 1** **Page 2 of 4**

Date	Hour		PHYSICIAN'S ORDERS
			(Orders with asterisks or check box options must be clarified by M.D. before ordered)
		*1.	**Admit to Dr. _____** **Inpatient bed status: Patient to be admitted to Unit 3900**
		*2.	Physician Consult:
		*3.	**Post tPA blood pressure management** • If BP out of target range, monitor and document BP q15 min. Verify BP reading with manual cuff. Avoid hypotension. • Target SBP is _____mmHg Target DBP is_____mmHg Other: _____
		*****4.	**Intravenous Therapy** ☐ Normal Saline _____ml/hr ☐ Normal Saline with 20mEq KCl _____ml/hr
		*****5.	**Diagnostics** Stat CXR and 12 lead EKG, if not already done Repeat Non-contrast CT of head 24 hrs + or – 6 hrs to be scheduled for (Date:_____Time:_____) Must check if additional tests are to be completed: ☐ MRI of head ☐ Cardiac ECHO to be read by_____ ☐ Carotid Doppler ☐ TEE to be read by_____ ☐ MRA of head ☐ intracerebral ☐ extracerebral
		*6.	**Additional Medications:**
		7.	Initiate Ischemic Stroke Pathway
		8.	Weight on admission and daily
		9.	**Diet** NPO until dysphagia screen completed by RN. May advance diet as tolerated, if dysphagia screen is normal. If screen is abnormal, consult Speech Therapist for evaluation and advancement of diet orders. Modified Barium Swallow, if recommended by Speech Therapist. Notify M.D. for further diet orders if NPO >48 hrs, if Speech Therapist not available. Mouth care after meals and before bedtime.
		10.	**Activity** Bedrest. Fall precautions ROM by RN at least q 8 hours. Turning schedule posted above the patient's bed No lifting or pulling of shoulder on affected side No phlebotomy or IV on the affected side, if possible

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747 **POST TPA ISCHEMIC STROKE ORDERS – Day 1** **Page 3 of 4**

Date	Hour		PHYSICIAN'S ORDERS
		11.	**Assessment** Seizure precautions. When thrombolytic started, record pulse, respirations, BP, and neuro checks (NIH Stroke Scale items 1,5 & 6): q 15 minutes x 2 hours THEN q 30 minutes x 4 hours, THEN q 60 minutes x 24 hours. Glascow Coma Scale q1hr. x 24 hours Complete NIHSS q 8 hours x 24 hours. A **decline** in Neurological status of 2 points in the total abbreviated NIHSS indicates the need for a **complete** NIHSS reassessment. Assess for pain on admission and q 8 hours using VAS scale Evaluate puncture sites for bleeding or hematomas every 8 hours; digital pressure or pressure dressing to actively bleeding sites. Evaluate urine, stool, emesis or other secretions for blood every 8 hours; if found, notify physician. **Call M.D. immediately for evidence of bleeding or neurologic deterioration, or vital signs outside the following parameters:** • SBP >185mmHg or < 110mmHg • DBP > 110mmHg or < 50mmHg • Pulse>120 or <50 • Respiration rate >24 or <12
		12.	Old chart to floor
		13.	Elevate head of bed 20-30 degrees
		14.	**Oxygenation** O_2 at 2 liters/min. per nasal canula. May increase up to 4 liters/min. to maintain sats >92% while in ICU. Contact M.D. for further orders if >4 liters/min. required
		15.	**Elimination** Foley catheter as needed, measure intake and output
		16.	**Consults** Case Management Services for Discharge Planning (Rehab, SNF, Home Care, or equipment needs) Physical Therapy to evaluate and treat Occupational Therapy to evaluate and treat Speech Therapy to evaluate and treat
		17.	**Labs** (Check desired labs) ☐ 24 hrs post tPA infusion start Stroke Panel (CMP, CBC, INR/PT, APTT) ☐ Urinalysis and culture (if not already done) ☐ IEP ☐ WESR ☐ Fasting lipid profile ☐ Cardiac enzymes ☐ FTA ☐ Other: _____

(PATIENT LABEL)	PHYSICIAN'S ORDERS DEACONESS HOSPITAL Evansville, Indiana 47747 **POST TPA ISCHEMIC STROKE ORDERS - Day 1** **Page 4 of 4**

Date	Hour		PHYSICIAN'S ORDERS
		18.	**Glycemic Control** Measure blood glucose levels a.c. and h.s. Initiate Humulin R Standard Insulin Sliding Scale-Standard Dose orders May discontinue checks if no Insulin or D50W has been administered for 24 hrs
		19.	**Education** - Patient-Family Teaching Guideline for Stroke provided to patient/family; documented by admitting RN. Information on new information provided by RN
		20.	Pneumatic compression stockings and TED hose
		21.	**Medications** **No Heparin, Coumadin, Ticlid, Plavix, Aggrenox or ASA to be given prior to (Date:_____Time:_____).** Tylenol 650mg. p.o. or rectally q 6 hrs p.r.n. pain or fever Dulcolax 10mg. rectally b.i.d. p.r.n. constipation, give if no BM documented in 2 days Promethazine 12.5mg. IV q 4 hrs p.r.n. nausea

PHYSICIAN'S SIGNATURE: _____

Deaconess Hospital Evansville, IN

CVA Care Path for Ischemic Strokes (TPA)

Expected Length of Stay: 4 Days

Day/Event → ↓ Category	Day 1 (NCC or ICU) Date_____	Day 2 (ICU → transfer to NCC Date_____
1. Desired Outcomes **Outcomes are initiated on days indicated but are expected to continue to subsequent days as appropriate.**	• No evidence of bleeding complications • No neuro decline • Respiratory status stable • No signs of aspiration • Hemodynamically stable	• Hemodynamically stable • No neuro decline • Respiratory status stable • No signs of aspiration • No evidence of bleeding complications
2. Consults	• Physician Consult • Physical Therapy • Occupational Therapy • Speech Therapy if RN Dysphagia screen abnormal • Case Management- assess DC needs-Rehab vs SNF vs home with Home Health and equipment needs	• Neurologist for meds. 24 hours after TPA administered
3. Assessments	• Weight on admission and daily • Document NIH Stroke Scale on admission and as ordered • Assess for pain using VAS scale q 8 hrs. • RN to do dysphagia screen. If Dysphagia screen abnormal, call M.D. regarding possible feeding tube placement for medications • I&O • Remote Telemetry • VS q 1 hr or as ordered • Assure BP is within target range. • Contact M.D. immediately for evidence of bleeding or neurologic deterioration or VS outside the target range • Seizure Precautions • Bleeding precautions as ordered • Glascow Coma Scale q 1 hour or as ordered	• VS q 4 hours if stable • Document NIH Stroke Scale score as ordered • Assess pain using VAS scale q 8 hrs. • Assure BP is within target range. • Seizure Precautions • Bleeding Precautions • Glascow Coma Scale, as ordered
4. Interventions **A. Test/Labs**	• Modified Ba Swallow if recommended by ST. • Lab and radiology as ordered	• Lab and radiology as ordered

Deaconess Hospital Evansville, IN

CVA Care Path for Ischemic Strokes (TPA)

Expected Length of Stay: 4 Days

Day/Event → ↓ Category	Day 1 (NCC or ICU) Date_____	Day 2 (ICU → transfer to NCC Date_____
B. Treatments	• O2 at 2 L N/C. Increase up to 4 liters to maintain sats >92% Contact M.D. for further orders if >4 liters required. • Pneumatic compression stockings and TED hose, if patient is not receiving Lovenox or Heparin. • No phlebotomy or IV on the affected side, if possible • Blood glucose monitoring per nursing staff ac & hs • Aspiration precautions if indicated	• O2 at 2 L N/C to keep sats >92% • Aspiration precautions if indicated
C. Medications	• Medications as ordered • Do not administer Heparin, Warfarin or Aspirin for 24 hours after TPA administration • Follow blood pressure management protocol, as ordered	• Change meds to p.o. if patient has passed speech evaluation. • Other meds as ordered

Care paths are a measuring tool for outcome evaluation. They do not reflect the standard of care owed by a professional health care provider to a patient, are not Warranties of results, and allows for deviation both to adapt to patient needs and to allow for variations in resources and the professional judgments of health care Professional.

Deaconess Hospital Evansville, IN

CVA Care Path for Ischemic Strokes (TPA)

Expected Length of Stay: 4 Days

Day/Event → ↓ Category	Day 1 (NCC or ICU) Date_____	Day 2 (ICU → transfer to NCC Date_____
D. Fluids	• Per Order; • NS w/wo KCl	• DC IV flds. if taking adequate p.o. diet
E. Nutrition	• NPO until dysphagia screen completed by RN. If dysphagia screen neg, advance to D.A.T. If dysphagia screen abnormal; consult ST for evaluation and orders. • Notify M.D. for further diet orders if NPO >48 hrs, if Speech Therapist not available. • Mouth care after meals and before bedtime.	• Diet as ordered
F. Elimination	• Foley catheter as needed	• DC Foley if patient can safely maneuver themselves to the bathroom or BSC with assist
G. Activity Progression	• Bedrest • Elevate head of bed 20-30 degrees • Fall precautions • ROM by RN q 8 hrs. • Turning schedule posted above bed. • No lifting / pulling of shoulder on affected side PT/ OT/ ST as indicated	• Out of bed in chair b.i.d. • PT/OT/ST as ordered • ROM by RN q 8 hrs.
5. Education/ Teaching	• Admitting RN to initiate CVA specific Multidisciplinary Teaching / Discharge Sheet • Admitting RN to give Patient/ Family Teaching Guidelines for Stroke and Stroke Patient Care Path to patient/family • Document information given on MultiDisciplinary Teaching/Discharge sheet.	• RN to give guidelines and medication information to patient/family
6. Discharge Planning	• Case Management	• Case Management to determine DC needs/plans: Rehab SNF HHC DME needs

Care paths are a measuring tool for outcome evaluation. They do not reflect the standard of care owed by a professional health care provider to a patient, are not Warranties of results, and allows for deviation both to adapt to patient needs and to allow for variations in resources and the professional judgments of health care Professional.

Deaconess Hospital Evansville, IN

CVA Care Path for Ischemic Strokes (TPA)

Expected Length of Stay: 4 Days

Day/Event → ↓ Category	Day 3 Date_____	Day 4 Date_____
1. Desired Outcomes **Outcomes are initiated on days indicated but are expected to continue to subsequent days as appropriate.**	• Adequate nutritional intake • Discharge disposition in place	• Tolerates PT/OT/ST as indicated by therapist. • Tolerates therapies bid if plans are home or rehab • Adequate nutritional intake • PT/INR therapeutic • Patient & family demonstrate safe ambulation, ADL's, and use of equipment
2. Consults	• Case Management finalize DC plans	
3. Assessments	• VS q 8 hrs. if stable • Document NIH Stroke Scale Score q day • Assess pain using VAS scale q 8 hrs.	• VS q 8 hrs., if stable • Document NIH Stroke Scale Score prior to discharge • Assess pain using VAS scale q 8 hrs.
4. Interventions **A. Tests/Labs**	• Labs as ordered	
B. Treatments	• Respiratory Therapist to wean O2. Keep sats >92% • DC blood glucose monitoring ac & hs if no insulin or D5W required times 48 hrs. • Aspiration precautions if indicated	• Aspiration precautions if indicated
C. Medications	• May change medicines to p.o. if patient has passed speech evaluation • Meds as ordered	• Pain or discomfort managed by oral medications, if needed
D. Fluids		
E. Nutrition	• Diet advanced as ordered	• Diet advanced as ordered
F. Activity Progression	• OOB with assistance t.i.d. • PT/OT/ST as ordered • ROM by RN q 8 hrs.	• Activity: Out of bed with assistance at least t.i.d. • ROM by RN q 8 hrs.
5. Education/ Teaching	• Family/Patient teaching re: Safe ambulation, ADL's, use of equipment	

Deaconess Hospital Evansville, IN

CVA Care Path for Ischemic Strokes (TPA)

Expected Length of Stay: 4 Days

Day/Event → ↓ Category	Day 3 Date_____	Day 4 Date_____
6. Discharge Planning	• Case Management to finalize discharge disposition • Case Management to determine and set up transportation • Patient/Family teaching on bowel and bladder training	• Aftercare support system is identified by Case Manager/Social Worker • PT, OT, ST to complete transfer forms • Discharge instructions completed by RN • RN to verify that all stroke and medication information has been provided • Bladder and bowel instructions given to the patient and family, if needed. • Elimination schedule established. • Patient and family to have an understanding of communication and cognitive deficits • Discharge medication prescriptions written and provided to patent or family, if needed • Follow-up appointment with M.D. • Discharge to home or transfer to outside facility